Transactions IAU, Volume XXXA
Reports on Astronomy 2018-2021
Maria Teresa Lago, ed.

DOI: 00.0000/X000000000000000X

COMMISSION C4

WORLD HERITAGE AND ASTRONOMY

PATRIMOINE MONDIAL ET ASTRONOMIE

COMMISSION C4 WORKING GROUP 1 ASTRONOMICAL HERITAGE IN DANGER

CHAIR **Alejandro Lopez**
BOARD **Juan Antonio Belmonte Aviles, Antonio Cesar Gonzalez Garcia, Steven Gullberg, Thomas Hockey, Jarita Holbrook, Javier Mejuto**

TRIENNIAL REPORT 2018–2021

1. Motivation and Creation of the Working Group

The working group has been constituted at the beginning of 2016. The objective of the WG is to make a list of sites with relevant astronomical value for Humanity that are currently at risk. The purpose of this list is to influence governments, nongovernmental organizations, international agencies, local authorities and decision makers to achieve protection and care of these sites.

2. Main Remarks during the Years 2018 and 2021

After the IAU general assembly in Vienna in August 2018, the process of reviewing the situation of the IAU WGs began. Our WG submitted its continuity proposal and its goals for the 2018–2021 triennium. In April 2019, the continuity of the WG was approved. Beyond this, during 2019 actions were taken to start meeting the objectives proposed in the continuity plan of the working group. In particular, some of them were emphasized:

- achieve greater visibility
- achieve a greater relation with the community of experts linked to cultural astronomy to foster debate on and commitment to the idea of astronomical heritage
- achieve a better relationship with other IAU groups/bodies/members that work with related issues, such as the proposed names for astronomical objects.

In this sense, we worked together with the *Inter-American Society for Astronomy in Culture* (SIAC) to include in its 2019 annual meeting in La Serena, Chile, a forum for discussion on astronomical heritage and its links with cultural astronomy. Under the organization of renowned experts (Priscila Faulhaber, Stanisław Iwaniszewski, Barthelemy d'Ans and Ricardo Moyano) an advanced workshop-course (*"Astronomy, Territory and Cultural Heritage"*) of 20 hours was created, for researchers in the area focused on this topic. The course was attended by 35 researchers from all over Latin America.

Also during 2019, in Argentina, we worked together with the local committee for the

contest to inaugurate *ExoWorlds* and their stars
(URL `https://www.iau-100.org/name-exoworlds-update`).
With the support of SIAC and the networks of those who work in cultural astronomy in Argentina, members of aboriginal communities were specially invited to participate in the contest and to propose meaningful and contextual names in their languages. In fact, the decision was made not to accept names in aboriginal languages that were not proposed by speakers or members of the communities that speak those languages. Specific instructions were written, participation was stimulated through specific networks and proponents were helped to submit their proposals. Thanks to this, proposals were received from five different towns. One of the proposals, by Abel Salteño, teacher and Moqoit leader was the winner.

During 2020 the COVID-19 pandemic poses a major challenge for everyone. Beyond this, during 2020 actions were taken to accomplish the objectives proposed in the continuity plan of the working group.

The main achievement of the WG during 2020 has been to homologate and prepare to publish the list of sites of astronomical heritage that are at risk that we have gathered during these years of work. It is a set of 15 sites in America, Africa and Asia. We attach the list as an appendix to this report.

One of the main goals of the WG is to influence the decision makers. This is a difficult objective to achieve due to the political complexity of situations related to heritage and its protection, which vary by country. This is clearly evident in the observations of the experts who contributed to the reports on endangered sites incorporated into the WG list. In that sense, we believe that it is an important advance that Alejandro López during 2020 was requested to give scientific advice to the Institute of Culture of Chaco, Argentina, in the context of the project to promote the meteoric dispersion of *Campo del Cielo* to the status of Provincial Cultural Heritage. In particular, he has given scientific advice in reference to the co-management of this heritage by the Moqoit aboriginal communities.

In reference to our goal to achieve greater visibility in the community of academic experts, in 2019 we had planned a round table on astronomical heritage at the joint meeting of the XII Oxford Conference and VIII SIAC Conference that was to be held in Argentina, during April 2020. This important event (the Oxford conference is the largest world event in cultural astronomy and this is the first time that it will be held in conjunction with a SIAC meeting) will now take place in November 2021 (if the pandemic situation allows it) due to COVID-19. It will be a critical opportunity to meet the goal of engaging the global community of experts in cultural astronomy around the issue of astronomical heritage at risk.

Despite the postponement of that meeting, we were able to achieve significant participation in three events during 2020:

1) In the first part of 2020, a paper in these issues was presented at the 235th AAS Meeting, Honolulu, Hawaii: "My Favorite Archaeoastronomical Sites in the United States: Preservation", from Thomas Hockey.

2) We participated in the organization (Alejandro López from our WG with Dr. Priscila Faulhaber and Dr. Ricardo Moyano) of the Symposium *"Políticas patrimoniales y conocimientos indígenas sobre el campo de relaciones Cielo-Tierra"* ("Heritage policies and indigenous knowledge on the field of Sky-Earth relations"), in the 15 Thematic Axis *"Procesos étnicos e interculturalidad: cosmologías, espacio de creencias políticas-religiosas y espirituales nativas"* ("Ethnic processes and interculturality: cosmologies, space of Native political-religious and spiritual beliefs"), of the VI Congreso *Asociación Latinoamericana de Antropología* (ALA) (VI Congress of the Latin American Anthropology Association) 2020, in virtual format (due to the COVID-19 pandemic) from Novem-

ber 24 to 27, 2020. An important event to make visible the problem of astronomical heritage sites in danger in the broader context of heritage studies. In this direction, Alejandro López presented at this symposium the oral contribution: *"El cielo entre nosotros: Patrimonio y dinámicas socioculturales en el Chaco Argentino"* (The sky between us: Heritage and sociocultural dynamics in the Argentine Chaco). A case study centered in the "Campo del Cielo" meteoric dispersión in Argentina. This work is in press in the Proceedings of the meeting.

3) Also we participated in the IAU Symposium 367 *"Education and Heritage in the Era of Big Data in Astronomy. The first steps on the IAU 2020–2030 Strategic Plan"*, 9–14 December 2020, Bariloche, Argentina. In this context Alejandro López, from our WG, delivered the invited talk: *"Cultural Astronomy: A scientific frame to understand academic astronomy as part of the Social World"*. WG member Juan Antonio Belmonte gave a public talk in Spanish: *"Astronomía, Paisaje y Patrimonio Mundial: de Gran Canaria a Chankillo pasando por Menorca"*. WG member Jarita Holbrook gave an invited talk: *"ASTROMOVES: Astrophysics, Diversity, Mobility"*. WG member A. César González García gave an invited talk: *"Our Sky, The Sky of Our Ancestors"*. Finally, WG member Steve Gullberg gave a talk during the *"Cultural Astronomy & Heritage"* session: *"Astronomy of the Inca Empire"*. Though not all these talks were directly connected to heritage, it was important to maximize our participation in this historic meeting. Now these contributions are in press in *"Education and Heritage in the era of Big Data in Astronomy. Proceedings IAU Symposium No. 367, 2020"*, R.M. Ros, B. Garcia, S. Gullberg, J. Moldon & P. Rojo (eds.). Cambridge, UK: Cambridge University Press.

During 2020, a contribution about the conflict related with development and heritage in astronomical contexts was published by Alejandro M. López: "Cultural astronomy perspectives on 'development"', in: *Astronomy in Focus – XXX, Proceedings IAU Symposium No. XXX, 2018*, ed. by M. T. Lago, *Focus Meeting 15: Astronomy for Development*, IAU, XXX General Assembly, 580–581. Cambridge, UK: Cambridge University Press. WG member Thomas Hockey made another significant contribution.

Another important advance in this regard is the participation of several members of this WG (Steven Gullberg, Alejandro López, Jarita Holbrook, Javier Mejuto) in the new *IAU-RAS-AAS committee on sensitive astronomical sites*. We believe that the perspective of our WG can add much to a committee that seeks to influence the way in which professional astronomers relate to situations where there are conflicts between large astronomical consortia and facilities and the local population. Considering the character of "astronomical heritage in danger" that these places have for many local populations can provide a more comprehensive perspective on the conflict situations described.

In terms of the impact on education, in 2020 Alejandro López was the teacher of the *"Virtual Course-Workshop on Cultural and Natural Heritage about Campo del Cielo and the meteorite rain"*. This course-workshop, orientated for museums workers, talked about the meteoric dispersion of Campo del Cielo, and was organized by the Material Heritage Department of the Cultural Heritage Direction, both dependent on the Institute of Culture of the Chaco, Argentina.

In reference to another of the goals proposed in the continuity plan of the WG (the relationship with amateurs astronomers), Alejandro López participated in three virtual conferences for groups of amateur astronomers in which the astronomical heritage in danger issue was discussed:

a) *"An intercultural perspective for astronomical education"*, within the framework of the First Virtual Conference on Astronomy Education, organized by the Parque Cielos del Sur, Municipality of Chivilcoy;

b) the conference *"Different worlds, different skies"*, in the virtual cycle "Astronomy

Tuesday" of the Civil Association for amateur astronomers, Bariloche, Argentina;
c) the conference *"Cosmovisions and cosmologies: the human experience of the sky"*, in the virtual Symposium "Astronomy and tourism", organized by the association of amateur astronomers "Cielo Guaraní", Posadas, Argentina.

3. Future

The COVID-19 pandemic poses a major challenge for everyone. In particular, this is true for the goals that we set for the 2018–2021 triennium. In this sense, during the rest of 2021 we will focus on the following aspects:

1. Ensure the holding of the proposed round table for the XII Oxford Conference-VIII SIAC Conference.

2. Promote, through electronic tools, the knowledge by the experts in cultural astronomy of the basic format of the case proposal for listing of astronomical heritage at risk prepared by the WG. The preliminary structure that has been designed to request such information is a provisional characterization that, in about 400 words, accounts the following information:

- Name of the site:
- Country:
- Short description (including cultures involved, age, contemporary usage, etc.)
- Astronomical Relevance:
- Is it declared a World Heritage Site?
- Situation of risk (main threats):
- Suggested actions to avoid risk:

3. Make public the present list of sites in danger, through various electronic channels.

4. Achieve greater visibility within the community of professional and amateur astronomers. In this sense, it is key to put them in contact with the results of the investigations of those who dedicate themselves to cultural astronomy. This can show them the relevance of issues related to identity, ethnic and cultural conflicts and colonialism for astronomical heritage.

On the other hand, we are convinced that the task of this WG is only beginning. That is why we will propose its continuity in the next triennium. During the same, we hope to increase the number of members, increase the reports of sites for incorporation to the list; publicize the list; and to encourage its use as a tool to promote the protection of the sites.

The focus during the 2021–2024 triennium will be:

(1) The collection of basic data to make up the list of astronomical heritage sites of humanity in danger is just beginning. It is necessary to achieve greater dissemination of the initiative among the academic community, especially among those engaged in cultural astronomy. We also hope to achieve an exchange with the WGs of Astronomy and Development and Education.

(2) Also it is necessary to achieve greater visibility within the community of professional and amateur astronomers. In this sense, it is key to put them in contact with the results of the investigations of those who dedicate themselves to cultural astronomy. This can show them the relevance of issues related to identity, ethnic and cultural conflicts and colonialism for astronomical heritage. It is an interdisciplinary task that requires the collaboration of experts from different areas of knowledge. It also requires dialogue with local communities and first-hand knowledge of their knowledge, values and challenges.

(3) It is important to expand the number of group members in the next few years.

Given its interdisciplinary nature it becomes crucial to find more agile mechanisms to incorporate people who do not belong to the IAU and / or are not astronomers.

(4) Another point of great importance is that the future WG work should help to promote that the astronomical developments (such as observatories) driven by universities or international consortiums favor the visibility of local astronomical traditions and traditional astronomical sites and landscapes. Similarly, we believe that the activity of the WG should promote that these astronomical developments incorporate, from their very first stages, specific and effective protocols of informed prior consultation. In this sense we think that the astronomers who participate in the development of these projects should have the list as an input that allows them to see other ways of looking at the sky and provides cultural relevance of the sky importance for teaching diverse students. For this reason, in the next few years, we hope to be able to increase the number of sites on the list and publicize them. We think that the collaboration with the new IAU-RAS-AAS committee on sensitive astronomical sites must be increased.

The activities of the Division C WG Astronomical Heritage in Danger are well-aligned with the IAU Strategic Plan 2020–2030 and the activities of IAU Division C. The WGAHD is linked with four of the Goals of this plan.

*Goal 2: "The IAU promotes the inclusive advancement of the field of astronomy in every country" (p. 9). In particular: "The IAU strives to be an inclusive organization within which all astronomers, regardless of nationality, ethnicity, religion, gender, sexuality, or disability, are welcome at all activities. Astronomy as a whole is enriched when there is a diverse body of astronomers, who bring a variety of perspectives, ideas, and approaches to the field." (p. 26). The WGAHD can contribute to inclusion in cultural, ethnic and national terms, since the preservation and recognition of the astronomical traditions of each society allows people to establish links between their past, their traditions and academic astronomy.

*Goal 3: "The IAU promotes the use of astronomy as a tool for development in every country." (p. 9). In particular, the Strategic Plan aims to support the UN Sustainable Development Goals (SDGs). Especially, the WGAHD can contribute with two important goals:

04) Promote quality education
10) Reduced inequalities

WGAHD can contribute to a quality education that incorporate the relationship with local astronomical traditions and the appreciation of their own past. This would allow empowering many ethnic and social groups so that they can appropriate academic astronomical knowledge and participate in its production.

Additionally, there is the possibility of job creation connected to preserving these sites, then protecting these sites, and educating visitors to the sites.

*Goal 4: "The IAU engages the public in astronomy through access to astronomical information and communication of the science of astronomy." (p. 9). In this case the WGAHD can contribute by adding efforts to the actions of the Office for Astronomy Outreach OAO for the decade 2020–2030, particularly "Encourage communication of science and critical thinking through IAU member public engagement, professional amateur, and citizen science activities" (p. 38). In this case, the visibility and protection of the astronomical heritage in danger contributes directly to critical thinking and public engagement. Also the WGAHD can collaborate with "Promote dark skies and the pale blue dot message" (p. 38). This is so because much of the astronomical heritage in danger relates the naked eye observation of the sky with cultural, artistic and historical

values. In this way, we can contribute to the protection of dark skies as part of "cultural landscapes" in the context of collaboration between WGAHD and UNESCO.

*Goal 5: "The IAU stimulates the use of astronomy for teaching and education at school level". (p. 9). Particularly, the WGAHD can contribute to the proposed actions for the IAU Office of Astronomy for Education (OAE). Specifically with; "identify accessible materials and astronomy literacy guidelines" (p. 42). Our previous work has shown us the enormous educational potential of the tangible and intangible astronomical heritage. Its evocative power allows to link astronomical knowledge with the values and interests of each local culture.

Within the IAU the WGAHD is proposed as part of Division C. The Strategic Plan says: "Division C seeks to further the development and improvement of all aspects of astronomy education, outreach, history and heritage" (p. 50). As can be seen, the WGAHD fits directly into the objectives of this division. In particular, it is crucial for fulfilling the interaction with UNESCO mentioned in the Strategic Plan: "Heritage includes the legacy of astronomical artefacts and structures as well as the astronomical attributes of mankind's cultural history, and benefits from close interactions with UNESCO". (p. 50–51). The Strategic Plan also says: "Division C activities are closely aligned and coordinated with the OAD, OAO and OYA, as well as with the proposed OAE. Division C will provide the knowledge and act as a "think tank" for the offices." (p. 51). The WGAHD is completely compatible and necessary for the fulfillment of these objectives. In addition, this means continuing with the strategic alliance established with UNESCO and ICOMOS since 2009. This has implied an enormous positioning and visibility of the IAU in areas of culture and society in which it was previously invisible.

Appendix added!

Alejandro López
Chair of C4 WG Astronomical Heritage in Danger

March 2021

Site 1:

Site name: Catequilla

Country: Ecuador

Report author: Cristobal Cobo Arízaga (quitsato000@gmail.com)

Report year: 2017

Brief description of the site (including cultures involved, age of the site, etc.):

Mount Catequilla Archaeological site.

Catequilla Archaeological site, code Z2F3 - 047 (Camino 2004) comprises a semicircular wall of approximately 107 meters in length with a diameter of approximately 68 meters, since there are no clear architectural features that accurately demonstrate the exact delimitation of its extremes both on the eastern and western side of it, with an inclination from the eastern end to the southern side, with an approximate azimuth of 113 degrees and a declination from the western end to the north side, with an azimuth approximately 293 degrees.

The GPS coordinates, datum WGS (World Geodetic System) 84, was obtained in 1997 resulting a reading of 0º0'0" for the latitude to the site, becoming the first exact and registered positioning for this context. This data led to formulate the possibility of knowing much more about the site, with the aim of solving whether the positioning in parallel zero was accidental or causal by the site builders. The archaeologist Oswaldo Tobar carried out archaeological surveys and excavations, which became the first evidences that demonstrated the cultural, aboriginal correspondence for the archaeological site.

Among the cultural affiliation of the recovered vestiges we have that in Loma de Catequilla there are basically aboriginal, Inca and even colonial ceramics. In an excavation that was carried out on one side of the wall of the north-west sector, a ceramic fragment was found that possibly corresponds to the Quitu-Caranqui filiation, in deposit D3, the same one that corresponds to a volcanic ash deposit of the Guagua Pichincha eruption occurred around 990 years before the present (bp), granulometric and mineralogical analysis carried out by the Volcanologist Patricia Mothes. With this evidence it is verified that the construction of the site corresponds to the aboriginal culture.

Catequilla, with its supposed meaning "the one who follows the moon", an etymology that was first proposed by Clements Markham in his edition of the chronicle of Sarmiento de Gamboa, is undoubtedly the one that draws the attention more between the different researchers, due to the possible astronomical implications that the site of Catequilla de San Antonio could have. Even John Topic (???) himself is inclined to suppose that the archaeological site of Catequilla, tends rather to work as an astronomical observatory than to the cult of Catequil.

Astronomical Relevance:

The Catequilla Observatory

Undoubtedly, what generates the most attention of this site is its positioning at zero latitude, and it is precisely this singularity that the researcher Luciano Andrade Marín mentions in one of his publications, "El Reino de Quito", this special characteristic of the site has also been mentioned by Almeida and Fresco.

And it is thanks to the mathematical data that technology provides us in relation to astronomy, which has motivated the undertaking of this study and it was on June 26, 1997, that we achieved the definitive positioning of the site, but, thanks to the support of satellite technology, with the application of GPS (Global Positioning System, Datum WGS 84), which not only allowed us to know the exact coordinates of the site, but also gave way to an exploration of the region with a totally innovative dynamic and above all fast.

According to the discussion of the archaeological site as an ancestral observatory, it should be noted that the mountain is an elevation that is very independent in relation to the surrounding mountainous structures, and this gives it some characteristics, the most important is that it is located in the zero parallel, exactly on the equinoctial line, its summit, enjoys 360 ° visibility, where 25 different ancient populations can be observed, the most important archaeological sites in the region, directly, without the help of optical instruments, so the observation is direct and simple. Although it is located at a lower height than other neighboring mountains, this represents an advantage, since it is the ideal place to use, as a horizon of observation and measurement, the other elevations. The people resident before the Spanish conquest did not have optical instruments, and that is a fundamental reason why the natural horizons of the mountainous reliefs of the Andes have been used as ideal instruments for horizon observations.

From the first moment we realized that the most representative archaeological and natural sites of the region were perfectly aligned with the rising and setting of the solstices and equinox, as well as with the North-South axes and the Ecliptic Axes.

However, these alignments could also be a coincidence, therefore we had to find the evidence that shows that observations have been developed at the site, that is, some indication of astronomical consciousness, in this way, the proposal that Pre-Incas, they were aware of their positioning at zero latitude, it was reasonable and, at the same time that the site possibly functioned as a matrix center that generated a large and complex territorial ordering, it was also within reasonable terms in relation to other cultures of the continent, such as the Mayas.

This is how we focus on the study of the different Lithic disks, since one of them is located precisely in the archaeological site of Catequilla, technical name, for the circular stone platforms, tiling composed of quarry stones, which were located in Intelligent way to draw different diametrical, radial, secant, parallel, perpendicular, grid lines and concentric circles. If there is any place in the world, where conditions are ideal for horizontal astronomical

observation, that is the top of Mount Catequilla in the Equatorial Andes, since we will not only have the advantage of observing the celestial vault with integrity due to its positioning. at parallel zero, but also because you have a defined horizon of 360 degrees. These conditions do not exist nowhere else around zero latitude. Therefore it is reasonable to suppose that the ancient inhabitants of the region developed an awareness about their latitudinal positioning and about celestial mechanics from their vision.

This knowledge is recorded in archaeological sites, specifically in the Lithic disks, which demonstrate a complex astronomical knowledge detailed in their alignments, projections and scales; likewise a geodetic link that is to be investigated in depth in the future.

Is it declared a World Heritage Site?:

It is not declared a World Heritage Site, but it does appear as a National Heritage of Ecuador, with its respective code, in the archaeological inventory of the Institute of Cultural Heritage of Ecuador.

Risk situation (describe the main threats):

Carelessness and negligence of the Institute of Cultural Heritage of Ecuador, since this institution has been in granting the good views both for the mining exploitation at the base of the dome, where the archaeological site is located, as well as the authorization for the civil construction on the archaeological site. There has been no professional follow-up to the archaeological interventions, which unfortunately interrupted the site with aggressiveness and a total lack of technical procedures. There is no type of control of visits, so the site is exposed to vandalism and contamination of all kinds. In short, the site has been attacked, altered, destroyed, deconceptualized, and the surrounding landscape has also been altered.

Suggested actions to avoid risk:

Declaration of a site in danger of extinction and permanent and planned protection with value and community involvement. The site must be expropriated, for obvious reasons, in an emergent manner.

Site 2:

Site name: “El Higuerón” pictograph

Country: Colombia

Report author: Armando José Quijano Vodniza (ajqv@coldecon.net.co)

Report year: 2016

Brief description of the site (including cultures involved, age of the site, etc.):

The pictograph of "El Higuerón" is a rock work located in the town of Mapachico, northwest of the municipality of Pasto, characterized by the abundance and quality of the paintings, most of which, despite the effect of natural agents, they still maintain their original appearance. Among the rocky mass, a fig tree rises, giving the name to the site and at its feet runs a ravine that pours its waters into the Pasto River. This rock work is located on the outskirts of the city of San Juan de Pasto, on one side of the road that leads from this city to the town of Genoy, its coordinates being 1° 15' 10" north of the equatorial line and 77° 18 '57" west of the Greenwich meridian; its height above sea level is 2,614 meters.

The first researcher who reported the existence of the "El Higuerón" pictorial was Wenceslao Cabrera in 1966, when he published his article Pictographs and Petroglyphs of Nariño in the Colombian Journal of Exact, Physical and Natural Sciences.

Astronomical Relevance:

The “El Higuerón” pictograph is formed by two flat rock walls, which have the following orientation with respect to the geographic north: 11° 08' and 285° 17', forming an internal angle between them of 85° 51' towards Northwest. Therefore, the first of the walls has its face directed approximately towards the western sky, while the face of the second rock wall faces the boreal sky. On both walls there is a series of figures made using only two types of color: red and yellow.

On the other hand, from the point of view of archaeoastronomical research, it was possible to demonstrate that the orientation and structure of the internal walls of the “El Higuerón” pictograph are of such characteristics that they can record the proximity of the summer solstice (20-21 of June of each year) when the following phenomena occur:

In the first place, the shadow projected by the rock wall whose face is directed north (azimuth 285° 17') on the stone wall whose face is disposed west (azimuth 11° 18') reaches the smallest in the year distance from the edge, for the same hour in the afternoon. Second, during the first hours of the afternoon (1 pm to 3 pm) the circular painting with eight rays is illuminated by the Sun, which, on its way to the horizon, descends from the celestial meridian projecting its rays on the cave wall. As the afternoon passes (approximately between 3 and 4 hours 45 minutes) the circle of the painting with eight rays is gradually covered by the projected shadow (from 0.06 meters to 0.12 meters). Likewise, in this period of time (between 3 hours

and 4 hours 45 minutes), due to the fact that the Sun is lower on the horizon, it can be seen with great clarity that the shadow projected on this day is quite uniform, being approximately parallel to the intersection edge of the two rock walls. As the observation date moves away from the day of the summer solstice, this shadow begins to become more irregular, its value increasing the closer it is to the winter solstice. Finally, in the late afternoon, as the Sun heads toward the sunset point in the northwest of the horizon, hiding behind the slopes of the Galeras volcano, the projected shadow continues to increase from 0.12 meters to 0.158 meters, thus being completely covered the circular painting with eight rays by said shadow. Therefore, the ancient Quillacingas only needed to observe the appearance of these events in the pictograph to know that the Sun had "returned" to the same point in the sky, this fact coinciding with the beginning of summer in the region. In addition to the importance of this date in the material life of the communities of the Andes of Nariño, it is currently recognized that the solstices also had great importance in religious life for these first societies, especially in those celebrations held to worship the power of the Sun that fertilizes Mother Earth and her annual rebirth; festivities that even last until recent times, despite the influence of European culture and the process of miscegenation that occurred with the arrival of the Spanish.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

From the point of view of conservation and protection of the “El Higuerón” pictograph, the new quarry that extends to the very edge where the fig tree that lies on top of the pictograph is found becomes a real threat, for the following reasons:

In the first place, the friction of the material thrown by the slope, or that falls due to the effects of gravity, produces abrasion on the cave paintings and on the rock that contains them. Second, there is a high possibility that in the long term a chemical reaction will occur between the minerals that make up the pulverized material (powder) that covers the paints and the minerals contained in the original pigment used by the indigenous people, which will cause the color degradation of the same. On the other hand, the great weight of the machinery used in the exploitation of the quarry produces a destabilizing lateral push on the slope that makes up the walls of the “El Higuerón” pictograph, which is aggravated considering that there are faults in these walls. A similar effect would be caused by the shock waves generated by the use of explosives near the rock work. Logically, if more material continues to be thrown on the site as the quarry works, there is a risk that the pictograph will be completely buried in a very short time.

According to what was observed in the neighboring quarries (such as that of "Santa Leticia"), the exploitation is carried out several meters deep, until the stone structure of the mountain is dismantled. If this procedure is applied in the area, it would imply the irreparable destruction of the rock work.

Suggested actions to avoid risk:

Taking into account that the “El Higuerón” pictograph is one of the last archaeological remains that are preserved in the municipality of Pasto, as a heritage from our ancestors, being one of the few pictographs that have been reported throughout the Andean area of Nariño and which has a proven astronomical value as a marker of the arrival of the summer season in the region, urgent actions are needed that allow, among other aspects, to commit the owners of the property to stop the exploitation of the quarry in the vicinity of the works, in order to minimize the negative impacts that this type of works can generate on this cultural asset.

In this sense, the inhabitants of the town of Mapachico from within the same community have initiated a series of actions aimed at knowledge and dissemination of this archaeological remains, as could be seen in the different testimonies collected during the visit to the pictorial that it was programmed in 2007 as part of the Patron Festivities of the Mapachico district, as well as in the workshop on talking maps on rock works carried out by the Inti Rumi research group on June 9, 2007 at the Mapachico School.

Site 3:

Site name: Church of Our Lady of Candelaria of Sotoca

Country: Chile

Report author: Cecilia Castillo (ccreisen@gmail.com)

Report year: 2017

Brief description of the site (including cultures involved, age of the site, etc.):

Sotoca, which in the Aymara language translates as Sut'uqa: Drag action, has one of the most beautiful churches located in the entire Andean mountain range, which was declared a national monument on August 8, 1953, by decree. DS 5705, which means that it is both a historical, cultural and architectural heritage, so its care, restoration and conservation must be carried out as soon as possible. The Church of Our Lady of Candelaria of Sotoca, which dates from approximately the seventeenth century, has similarities in architecture and the paintings found inside with the Parinacota churches located in the Arica Parinacota plateau, near Lake Chungará and the temple of Pachama that is located in the Arica range. However, the Church of Sotoca is larger than the previous two but maintains some similar forms, with the difference that it has a bell tower attached to the temple and has a Latin cross plan, which is formed by the central nave and two side chapels located at the height of the presbytery (altar).

The walls of the church are built by means of a system of "pirca" (or "apircado"), rustic stones joined with mud mortar, with 80 cm thick walls. The bell tower, made of stone masonry and windows. The arch was rebuilt in reinforced concrete with stone cladding, after it was severely damaged in an earthquake in January 2002. Regarding the paintings that are located inside the church, these correspond to two different periods, which are on the walls of the central nave of the temple with figures of saints, correspond to the newest, which suffered significant damage due to a fire that occurred in the mid-twentieth century, which produced almost a total loss of pigmentation (colors) of the drawings, a product of the flames, smoke and intense heat. This is an unfortunate event, which is obviously not loved by anyone but whether you like it or not, it is part of the history of Sotoca. Other unfortunate events that generated alterations in the structure of the church, such as the earthquakes that occurred a few years ago, such as the 2001, 2002 and 2005 earthquakes.

Astronomical Relevance:

The Church is located in the center of the town, with the front facing some sacred hills that face the East, which is where the first ray of sun rises and is expected in the month of June, it is also where they descend the comparsas and the bands and lakas greet when arriving at the town.

Inside the church, the oldest paintings that are considered by specialists of the mestizo baroque style or also called Andean baroque, with a plastic theme that has a defined religious character, specifically Catholic, which when related to the indigenous culture of the Andes,

resulted in a true Catholic-indigenous mixture conjugated by the use of colors such as green and red, extracted from natural pigments, as well as an abundance of plants such as corn, flowers, etc. These paintings (the oldest) are found especially in the two side chapels that surround the ancient altars. Outstanding are the images that appear in the arches of the two side chapels, in which a sun and a moon with human faces are drawn, each of these elements individually in the arches, surrounded by foliage. In the figure of the Sun carved in stone in the church, there are between 28 and 29 rays that it is possible to represent the Lunar cycle.

The sun and the moon are characteristic of indigenous art that could represent the stars of the Andean cosmogony such as INTI (sun) and P'AXI (Moon), they are the representation of respect and devotion to the stars. In addition, the paintings with these motifs (Sun and Moon), with human faces, can be found in the drawings made by the Andean indigenous chronicler Huamán Poma Ayala in 1615 and which are of the same style that we find in the arches of the Church of Sotoca.

The ritual sacrifice of a young white male llama is performed to honor the ancestors and the Pachamama on June 28th, before celebrating the feast of Saint Peter and Saint Paul. The most important thing about this ceremony is that the sacrifice of the animal must be done just with the first ray of sunlight.

Is it declared a World Heritage Site?: No, It is a National monument since 1953.

Risk situation (describe the main threats):

The reconstruction of the Church was requested in 2013, where resources were approved to design it. Only in 2017, in the month of June, the design approved, and a more in-depth report of the archaeological remains was requested by the National Monuments Council. In order to see the funds for reconstruction in January, however, the construction of the altarpiece and the paintings are not contemplated. In the case of the Altarpiece it is because there is very little information about the original Altarpiece and only some photographs. Therefore, with a work team we are applying for a fund to carry out the investigation of the altarpiece, which according to what they say was very similar to an altarpiece found in a church in Cuzco. In the case of the paintings, they are still seeing how to do it, because the deterioration due to the rains, the weather is quite noticeable and in Chile there are few restorers and the national restoration center is located in Santiago. In these years the Church is in poor condition because the constant tremors have caused the bell tower that was built without supervision, by the community, to hit one of the side walls, which we will lose and must be completely rebuilt. And of course, the highland winter, along with the passage of time, has caused the arches and part of the front roof to fall.

Suggested actions to avoid risk:

Rush actions to rescue paintings and other architectural elements that indicate both tangible and intangible heritage, avoid continuing to lose cultural elements over time.

Site 4:

Site name: Xochicalco, Morelos.

Country: México

Report author: Rubén Bernardo Morante López (rubenmorantel@hotmail.com)

Report year: 2017

Brief description of the site (including cultures involved, age of the site, etc.):

Site's apogee period goes from 650 to 900 CE. It has numerous buildings (four ball courts), hieroglyphic writing, mural painting and reliefs of enormous cultural value. Most likely Nahuatl was spoken. Its calendrical inscriptions are the most numerous in central Mexico during the Classic period, probably in this site the Mexican-Aztec calendar that the Spaniards found in the sixteenth century in Mexico Tenochtitlan was originated, according to the studies carried by Rubén Morante.

Astronomical Relevance:

Two elevations indicate a precise horizon calendar with solar rises, according to Morante's studies: the Jumil hill on October 29/30 and February 11/12 indicating the two Mesoamerican calendars with 260 and 365 days. The other is the Popocatepetl with the solar rises on the two days of zenith passage, on May 15th and July 29th, observation of the horizon that is combined with underground observation in the most advanced underground observatory known in Mesoamerica and that it is located just below the site where the sun rises over Popocatepetl in the morning.

Is it declared a World Heritage Site?: Yes

Risk situation (describe the main threats):

An open pit mine has been proposed on Cerro Jumil, which would destroy this critical point on the horizon. The pollution of the city of Cuernavaca every day generates more smoke and makes it more difficult to see towards Popocatepetl.

Suggested actions to avoid risk:

Declare the Jumil hill part of the Protected Cultural Landscape and take extreme measures for the emission of gases in Cuernavaca.

Site 5:

Site name: Yarumela

Country: Honduras

Report author: Javier Mejuto (javier.mejuto@unah.edu.hn)

Report year: 2016

Brief description of the site (including cultures involved, age of the site, etc.):

Archaeological complex located on the banks of the Humuya River that extends approximately 30 hectares. At the current point of investigation, the site has been proposed as a settlement that played a preponderant role as a point of trade between the Pacific area and the Caribbean Sea. The settlement dates from approximately 900 BCE and it was inhabited by Protolenca peoples of southwestern Honduras and eastern El Salvador.

Astronomical Relevance:

Possible astronomical alignments towards the extreme positions of the Sun between various structures at the site.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

- Abandonment of the site by state institutions in charge of heritage conservation.

- Total exposure of the archaeological remains.

Suggested actions to avoid risk:

- Creation of an archaeological park for its visit, care and museum.

- Delimitation and closure of the extension occupied by the archaeological site that enables its conservation and research.

- Training of social actors in contact with the archaeological site, promoting the apprehension of said heritage among current inhabitants and local and national authorities.

Site 6:

Site name: Ayasta Rockshelters

Country: Honduras

Report author: Javier Mejuto (javier.mejuto@unah.edu.hn)

Report year: 2016

Brief description of the site (including cultures involved, age of the site, etc.):

It is a group of rock shelters on whose walls a large number of rock art elements are distributed, especially petroglyphs. The settlement associated with the shelters is known but the ethnic affiliation of the inhabitants is unknown. An approximate dating of the year 1000 BCE is considered.

Astronomical Relevance:

Geometric elements appear among the figures represented in the cave art of the shelter, on which the first rays of the Sun fall in the sun rise in the winter sun. Also, cavities appear on the wall, resembling time periods records. Finally, possible representations of non-cyclical astronomical events appear; in particular a comet and a partial solar eclipse are drawn.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

The site does not have surveillance to protect it from the action that visitors may take on it. Evidence of vandalism has been found that has led to the loss of various elements of rock art. Likewise, some of the marks with wear are observed whose origin could be natural erosion or due to strong tourist pressure.

Suggested actions to avoid risk:

- Controlled access to the site and musealization.

- Training of social actors in contact with the archaeological site, promoting the apprehension of said heritage among current inhabitants and local and national authorities.

Site 7:

Site name: Tolupan Cosmovision

Country: Honduras

Report author: Javier Mejuto (javier.mejuto@unah.edu.hn)

Report year: 2016

Brief description of the site (including cultures involved, age of the site, etc.):

The Tolupanes are an original people of Honduras whose first news of their existence dates from the year 1536 CE through contact with the Spanish conqueror Pedro de Alvarado. At present, the Tolupan people have a few hundred members, being the inhabitants of the La Flor mountain. Those who maintain their culture in a more independent way from external influences. This includes their language, Tol, also endangered.

Astronomical Relevance:

The Tolupans have a huge intangible astronomical heritage in the form of their worldview and cosmogony. Likewise, their language includes numerous astronomical terms exclusive to the languages of the Tequistlateco-Jicaque family. As an example appears the differentiated and specific rites for eclipses of the sun and moon that are identified as grandfather and grandmother, respectively, of humans.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

- Risk of disappearance as an original people.

- Risk of disappearance of the Tol language.

- Risk of cultural dilution.

Suggested actions to avoid risk:

- Promote the scientific study of the Tolupán culture

- Interact and raise awareness through specific programs to local and national actors about the relevance of the astronomical heritage represented by the original Tolupán people.

- Disseminate and protect the territory occupied by the Tolupán people that allows their cultural protection and avoids the attack on their systematically violated human rights.

Site 8:

Site name: Archaeological sites of Libya

Country: Libya

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

Various archaeological sites in Libya, both from the Greek (Cyrene), Roman (Leptis Magna, Sabratha, etc.) or earlier (Garamantian sites in the Fezzan).

These include the plan of Roman towns and the orientations of temples in Tripolitania. The data of the sites of the Garama Kingdom (V C. BCE to VII C. CE) include pyramids fields and large tumular necropoleis.

Astronomical Relevance:

In our works of the past decades, we showed that they had enormous archaeoastronomical value.

Roman data shows a clear preference for solar orientations, notably to solstices and equinoxes.

Garamantian sites an interest in 'equinoctial' orientations.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

The socio-political situation in Libya is very complex. Sites are being systematically looted.

Suggested actions to avoid risk:

It is very difficult to recommend courses of action in the current socio-political panorama.

Site 9:

Site name: Archaeological sites of Tunisia and Algeria

Country: Tunisia and Algeria

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

In Tunisia and Algeria, it is unknown what is happening given the little state control exercised over the heritage in the context of the present instability, but no systematic looting or destruction has yet been reported.

Astronomical Relevance:

As in Libya, Roman, besides Numidian and Punic, data shows a clear preference for solar orientations, notably to solstices and equinoxes.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

Little state control exercised over the heritage in the context of the present instability, but no systematic looting or destruction has yet been reported.

Suggested actions to avoid risk:

Tunisian democratic government has improved the heritage control. The main risk now is the absence of tourists due to the pandemics who settles a very dangerous social situation.

We don't have information about the situation in Algeria.

Site 10:

Site name: Temple of Serabit el Khadim in the Sinai and sites of Middle Egypt and the Eastern and Western Deserts

Country: Egypt

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

This is a very peculiar temple in the middle of a turquoise mining area that was exploited form the Old to the New Kingdom.

Astronomical Relevance:

The temple includes a turning axis, which can be explained by the turning position of Sirius's rising due to equinox precession.

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

The danger to the temple of Serabit el Khadim in Sinai and to some sites in Middle Egypt and the Eastern and Western Deserts from the conflicts and looting produced by the political conflicts after 2011 is notable. Besides, this area is under Daesh control.

Suggested actions to avoid risk:

It is difficult to suggest actions in the present context. The Sinai Peninsula is one of the most unstable regions of Egypt now.

Site 11:

Site name: Palmira, Hatra, Ebla, Apamea, Dur-Sharrukin and Nineveh

Country: Syria and Iraq

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

These are a large series of splendid cities in the cradle of our culture in the Middle East. There are monuments from the Neolithic to the Muslim era, notably Assyrian palaces, Amorrean and Roman cities, among many other sites.

Astronomical Relevance:

The region remains unexplored form the astronomical point of view due to the civil war in Syria and the Daesh expansion.

Is it declared a World Heritage Site? Some of them like Palmira and Hatra, yes.

Risk situation (describe the main threats):

In Syria and Iraq, the destruction of heritage has been enormous by Daesh or related groups. The global effects of the disaster are still unknown but there are still unexplored sites with enormous potential that have been systematically looted, such as Ebla or Apamea, or where ancient temples have been directly dynamited, such as Palmyra, the Jewel of the Desert, or Hatra. That's not counting the systematic looting and destruction (even with excavators) from Assyrian sites such as Dur-Sharrukin or Nineveh where the famous Ashurbanipal library was found which included the Mulapin Tables with the astronomical knowledge of Mesopotamian civilizations.

Suggested actions to avoid risk:

None, until the political situation improves. UNESCO is already hands on.

Site 12:

Site name: Baalbeck

Country: Lebanon

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

One of the most important Roman cities of the Levant, including a huge temple area, with roots in more ancient civilizations.

Astronomical Relevance:

Astral cults played a central role for centuries in this city. Much of the possible archaeological records of these practices have yet to be explored, although Giulio Magli have performed a most interesting preliminary study.

Is it declared a World Heritage Site? Yes

Risk situation (describe the main threats):

Lebanon is on the front line of conflict with Daesh and the fighting was in 2016 at the gates of Baalbeck, the Heliopolis of the Romans.

Suggested actions to avoid risk:

UNESCO is hands on. It is impossible to visit the area due to the current political instability of Lebanon.

Site 13:

Site name: Göbekli Tepe and Nemrud Dag

Country: Turkey

Report author: Juan Antonio Belmonte (jba@iac.es)

Report Year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

On a barren isolated hill called Göbekli Tepe a team of German and Turkish archaeologists (Schmidt, 2006) are excavating a cluster of suggestive stone monuments erected with large, megalithic pillars in the form of a T within a series of dry-stone enclosures. They started to be built by a completely unknown hunter-gatherer society more than 11,000 years ago. These series of sanctuaries, built presumably one after − and even upon − the other, would have remained in use for centuries, perhaps millennia, but were deliberately buried by their own constructors for unknown reasons, a singular fact that contributed to their excellent state of preservation despite of their great antiquity.

The Kingdom of Commagene was a small country between the upper course of the Euphrates and the mountains of Anti-Taurus in the south-east of Anatolia. Commagene played, despite her tiny size, a relevant role in the history of the Middle East during the late Hellenistic and early Roman periods as a buffer state between the powerful Seleucid (later Roman) and Parthian Empires. Antiochos I Theos (c. 69-36 B.C.E.) arguably was the most important of her kings, governing for more than 30 years in one of the most challenging periods of the region's history. The world heritage site of the "hierothesion" (burial monument) of Antiochos I at Nemrud Dag certainly constitutes one of the most fascinating historical enigmas in human culture worldwide. The monument includes a stone slab with the famous lion "horoscope".

Astronomical Relevance:

Is undebatable is that between the series of monumental structures, there is one with nearly rectangular walls which were almost perfectly aligned according to the cardinal points (see Fig. 2). This circumstance alone would force us to think that we are faced with a society that had a look at the sky and used it as a guide to find appropriate ways of orientation in space and, almost certainly, also in time. Within this context, we could perform additional exercises, analysing the profuse decoration of the T-pillars where we may already find atavistic astronomical representations such as the Crescent and the star, so common in later cultures of the Middle East and beyond, or even totemic representations of animals which, allowing a little speculation, would remind us constellations, such as Leo, Taurus or Scorpius, that we can recognize in the skies of other evolved cultures in the region several centuries

later. Interestingly, one of the pillars of the cardinally orientated hall, which was framing an altar on the eastern side of the structure, has a representation of a lion; and Leo was rising with the sun at the Spring Equinox precisely at east in the epoch of construction of this particular shrine. A moment in time when Taurus and Scorpius where marking other annual cycle milestones such as the solstices.

The burial monument of Antiochos I at Nemrud Dag includes a stone slab with the famous lion "horoscope". On the slab, a lion with stars on his body, likely the constellation of Leo, is represented together with a crescent moon on his chest and three planets, identified in Greek as Pyroeis of Heracles, Stilbon of Apollon and Phaeton of Zeus, standing for Mars, Mercury and Jupiter, respectively. The possibility that the slab depicts a real or schematic astronomical scene or an astrological image introduced the idea of dating the monument and interpreting its nature since the earliest archaeological studies of the site. The most accepted conclusion so far had the support of Neugebauer and Van Hoessen (1959) who argued that the scene might represent a sort of horoscope for the date July 7, 62 B.C.E. at the beginning of the reign of Antiochos I. The conclusion of our team was that Antiochos' monument reflected the situation of the skies at exclusive moments of the year 49 B.C.E. On the one hand, the five cyclopean statues of the eastern terrace would have been facing sunrise followed by the rising (obscured by the solar glare) of their celestial manifestations (the planets) in the constellation Leo on July 23, 49 B.C.E., commemorating Antiochos' ascent to the throne as explicitly mentioned in the inscriptions on site (nomos). On the other hand, a few months later, their equivalents of the western terrace would have been facing sunset on December 23, 49 B.C.E. in commemoration of the king's birthday. Consequently, according to our proposal, the main elements of the eastern and western terraces of the hierothesion should have been deliberately aligned to sunrise of Loios 11 and sunset of Audnayios 16 (the two festival dates mentioned in the nomos), respectively, in the year 49 B.C.E. The lion's horoscope could consequently be assigned a new date to July 12, 49 B.C.E.

Is it declared a World Heritage Site? Nemrud Dag, yes, Göbekli Tepe is in the tentative list.

Risk situation (describe the main threats):

The archaeological sites of southeastern Turkey, especially Göbekli Tepe cradle of humanity, and Nemrud Dag are affected and in serious danger because they are located in the rear of Daesh and because of the escalation of the conflict between the Turkish government and the Kurdish separatists.

Suggested actions to avoid risk:

The Turkish government has closed the area to foreign visitors. It is difficult to know what the current situation can be.

Site 14:

Name of the site: Megalithic monuments

Country: Jordan

Report author: Juan Antonio Belmonte (jba@iac.es)

Report year: 2021

Brief description of the site (including cultures involved, age of the site, etc.):

Since the nineteenth century, the British Palestine Exploration Fund has carried out archaeological surveys and expeditions on the eastern bank of the Jordan River, around the main ruins of Rabbat Ammon, the modern Amman, and in the area situated just south of Hauran, along the present Syrian border. The expeditions led by C. lrby and J. Mangles along the Jordan River, by C. R. Conder near Amman and in the Madaba areas, and by G. Schumacher in the north, along the Wadi Yarmuk down to Ajlun, recognized and depicted hundreds of archaeological sites with many dolmen fields between them. These monuments, called by the first English surveyors "rude-stones monuments" were immediately associated with the western European dolmens and inserted in a general prehistoric period. At present it is possible to say that dolmens appear for the first time in the Southem Levant at the end of the Late Chalcolithic Period (c. 3800/3500 B.C.E. based on Cl4 date from the abandonment phase of the Tuleilat al Ghassul sacred area). During the Early Bronze Age I (EB 1B which ended between c. 3000 and 2900 BCE.), these megalithic monuments were used for funerary purposes (large family tombs for primary or even secondary interments) by the pastoral and agricultural communities of the Transjordan Plateau. During this period, which was a critical moment in the urbanization process in the Levant, the communities were probably organized in different clans; among these, some populations settled in more fertile areas practicing horticulture and seasonal agriculture; meanwhile, especially in the semi-desert areas, there prevailed a pastoral style of life. Dolmens are funerary monuments marking the landscape, both in fertile and in semi-desert areas, following the course of the seasonal rivers running across Jordan. These monuments represent the creation of a communal ideology, connecting the ancestor cult with the territory, probably very useful as a social and political binding agent between different communities. To material culture from the dolmen field excavations and the landscape archaeology analyses of this phenomenon point to this conclusion.

Astronomical Relevance::

We have found evidence of an astronomical intentionality in the orientation of the dolmens in all the necropolises under study (marginally so in the case of Juffayn). The patterns, although statistically significant in most cases, are not identical, and each site offers its own peculiarities, as shown in Figures 6 and 7: northern cardinal for Dahmiyeh, either sunrise or moonrise in a wide general sense for Wadi Jedid and Tawaniyeh 1, and southern most solar and/or lunar declination for Al Mureighat (certainly in combination with a topographic rnilieu related to the sacred area on site).

Is it declared a World Heritage Site?: No

Risk situation (describe the main threats):

We faced the rapid destruction of the Hashemite Kingdom of Jordan's megalithic heritage, due to the building expansion which has converted several of the zones where the necropolises are located - and even the monuments themselves - into gigantic quarries, so as to obtain stone for construction and urban development. All of these in the context of an overcrowded country that has hosted millions of refugees.

Suggested actions to avoid risk:

A visit to the site would be needed to ascertain what the current situation is now, and how much the quarries have progressed towards the dolmen fields.

Site 15:

Name of the site: Meteoric dispersión of *Campo del Cielo*

Country: Argentina

Report authors: Alejandro López (astroamlopez@hotmail.com) y Sixto Giménez Benítez (sixto@gmail.com)

Report year: 2020

Brief description of the site (including cultures involved, age of the site, etc.):

In the provinces of Chaco and Santiago del Estero, in Argentina, there is a very important dispersion of nickel-iron meteorites: Campo del Cielo. This is the result of the impact of a large metallic meteoroid about 5800 years ago. Many meteor fragments are found scattered over a narrow strip of about 100 km by 3 km. Fragments are found both on the surface and buried, and no fewer than 26 impact craters have been located. Additionally, two of the fragments found (*Gancedo* and *Chaco*) are the second and third heaviest meteorites found on Earth. These objects, in an alluvial plain with almost no rocks, were a focus of interest since pre-Hispanic times. This is evidenced by various colonial references. In fact, this dispersion is of great relevance for the cosmological ideas of the *Moqoit* aboriginal people, who associate them with rains and the presence of the power of celestial beings on the ground. For them, meteorites are a crucial part of a network of "sacred places", landmarks of their ethno-territory that account for encounters with powerful beings and the pacts with them, they are also a memory of the travels of groups of relatives and their human and not human alliances. The European and Creole population were also deeply interested in these meteorites and were objects of various speculations that related them to silver or iron mines. Today for non-aboriginal people they are seen as signs of the divine choice of the territory and the "pioneering spirit" of its inhabitants, as well as promises of international tourism. On the other hand, it is a dispersion of great interest from an academic astronomy point of view.

Astronomical Relevance:

It is a unique case of a cultural skyscape that involves the relationships of a complex interethnic network with the sky and the Earth. It is unique because of the documentation of a link extended for centuries and active today. It is a relationship with celestial objects that involves not only academic interest but a complex web of interests and relationships of all

kinds. A true concentrated example of human relationships with the sky as part of the daily life.

Is it declared a World Heritage Site? No. Although, in theory, various national and provincial laws protect meteoric pieces and craters.

Risk situation (describe the main threats):

Despite the legislation there is an active international contraband of meteoric pieces, and many craters, located in farm fields, suffer damage by not being protected. On the other hand, there is no adequate protection of the *Moqoit* aboriginal people ties with these meteoric masses. There is no comprehensive management plan for this heritage and there are no institutional mechanisms to formalize the obligation of prior informed consultation to the *Moqoit* communities in relation to the decisions made on meteorites.

Suggested actions to avoid risk:

The governments of the provinces involved and also the Argentine national government should be urged to safeguard this extraordinary cultural skyscape and understand its relevance for the aboriginal population. The contraband of meteorites should be discouraged from astronomy and science organizations. It would be pertinent to encourage other countries to establish legislation that prevents the traffic and sale in their territories of pieces of Campo del Cielo. Similarly, international academic and artistic institutions should avoid promoting the extraction of Campo del Cielo pieces for their collections. It is necessary to support local, national and international education campaigns of the importance of this meteoric dispersion and especially that its value lies in the human and environmental context in which it is framed. This is very important to try to avoid smuggling.