

# PROTECTING THE CANARIAN SKIES A PRACTICAL EXPERIENCE

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## Introduction

The main aim of this contribution is to give an idea, in a practical way, of what is involved in protecting the astronomical quality of top-ranking observatories such as those belonging to the Instituto de Astrofísica de Canarias. We shall review, from the beginnings of the Sky Law to the present day, various aspects in which work has been done to achieve the objective of preserving the astronomical quality of the skies above the Canaries.

## History

Although many think that 31 October 1988 was the beginning of the Law to Protect the Astronomical Quality of the Observatories of the IAC, in fact the period of gestation was a long one with not a few difficulties, given that scientists in Spain and the rest of the world had been waiting for the Law since 1979, the year in which the IAC signed its first international agreements in anticipation of the Law. But it would be necessary to wait a little longer for its actual application – until January 1992 to be precise – when the Sky Protection Unit was created within the General Administrative Services of the IAC. The regulations governing the development of Law 31/1998 was passed on 21 April 1992. From its very beginnings, the Law covered four fundamental aspects.

## *Light pollution*

This has been an aspect of overriding importance within the Law, but it applies only to Roque de los Muchachos Observatory, although it also partly affects Tenerife, which is directly visible from La Palma. Naturally, it also applies to the island of La Palma itself, where the Law has been applied retroactively, for which reason numerous adaptations of lighting installations have been carried out since 1992. In 1994 the first island-wide adaptation of lighting (divided into two phases) was begun. A total of 2976 lighting fixtures were substituted and modified, thereby reducing light pollution by 35% of what it was in 1992.

The second phase, that of the adaptation process on the island of La Palma (itself divided into three

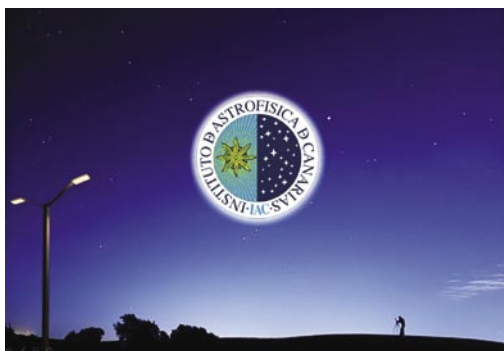




Figure 1. For the best possible control over levels of light pollution at both IAC Observatories a system of measurements of pollution has been set in motion. So far, 250 hour of observations at Teide Observatory and 328 hours at Roque de los Muchachos Observatory have been made. Tests are currently under way of other measuring instruments to supplement and refine the measurements being made with those already in use so that we may have more reliable values for sky quality.

than 2000 light fixtures and some 2300 in the second and third phases, giving a total of 4300 modified fixtures.

The adaptations involve on the one hand a potential 40% (approximately) reduction in light pollution and on the other a considerable saving in consumption of electricity for the municipal funds.

For the correct application of the Law it was necessary to contact various lighting manufacturers in order to keep lighting within the limits of the new law. For this purpose a great many lighting fixtures were tested and certified in order to help engineers and designers to carry out lighting projects according to the specification of the Law. There are currently 230 certified lighting fixtures and 30 different manufacturers.

For controlling pollution the Law specifies that all new exterior lighting installations be accompanied by a technical report issued by the IAC as a guarantee that the new installation fulfils the regulations. So far, 1625 technical reports have been issued for lighting installations, but not all new lighting installations are examined by the IAC; hence, given that these installations are either illegal or subject to special circumstances, from 1994 onwards all those installation not conforming to the law have given rise to legal proceedings against the

phases), is currently in progress. This involves changing those installations that have not been previously adapted, given that the levels of contamination are minimal (although still highly damaging to astronomical observations).

These new modifications, apart from enabling an improvement in astronomical quality through lowering the levels of light pollution, will take effect over a long period and will lead to clean, minimally contaminated skies, as well as unifying the entire lighting of the island according to the specification of the Sky Law. In the first phase, it is envisaged to change more



Figure 2. Lighting fixtures which comply with the Canary Islands Sky Law.



Figure 3. Lighting fixtures which do not comply with the Canary Islands Sky Law.

promoters of the installations. A total of 896 cases of legal action been taken so far, of which 617 have been resolved after 3310 inspections.

For the best possible control over levels of light pollution at the IAC Observatories a system of measurements of pollution has been set in motion. So far, 250 hour of observations at Teide Observatory and 328 hours at Roque de los Muchachos Observatory have been made. Tests are currently under way of other measuring instruments to supplement and refine the measurements being made with those already in use so that we may have more reliable values for sky quality.

One ourmajor concerns since the creation of the Law has been publicizing it, since this affects its entire development. This concern has meant that, from its beginnings, the Law has been given ample coverage in the news media, talks and numerous articles. So far, a triptych, two leaflets, two posters, three technical manuals, a video, cd-rom and a website have been produced and kept updated.

### *Radioelectrical contamination*

This is one aspect of the Law that, although less difficult to tackle, is no less important for that. To control radioelectric contamination an agreement has been reached with the Secretary General for Communications in order to carry ut periodic measurements of the radiofrequency background at both observatories. A portable instrument is available for the measurements to detect levels above those established by the Law. Thirty-five technical reports have so far been issued and legal action has been taken against five radioelectric installations (all have been satisfactorily resolved).

### *Air routes*

This has been one of the greatest achievements of the IAC in regard to the protection of its observatories. In 17 May 1998 the air space of the IAC observatories was declared an “Ecological Protection Zone”, with all the practical effects implied following negotiations with the Civil Aviation Authority.

At first, according to the Law, the interpretation of this area of protection takes the form of a pencil-shaped zone 10 km in diameter with the pencil point located at the observatories. However, the Law applied only to established air routes, not to those of more than 5 km or non-routed flights. With the new declaration, these deficiencies were removed so that the observatories are now totally protected from all kinds of aircraft. *Atmospheric pollution*

This aspect of the Law, which limits the pursuance of industrial or other contaminating activites at altitudes greater than 1500 metres, and which

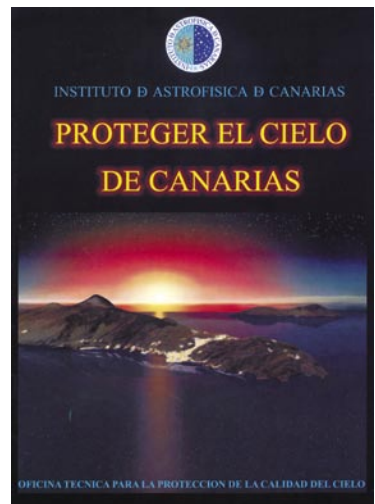


Figure 4. Leaflet on the Canary Islands' Sky Protection Law. It contains a practice guide and regulations on external lighting and recommendations to fight against light pollution.



*Figure 5.* Dome of the GTC (Gran Telescopio Canarias) on La Palma. Photograph: Ángel L. Aldai. Photo kindly provided by the Science, Technology and Innovation Office of the Canary Islands Government.

skies. We also need to understand that clean skies are not only a resource for scientists but also form an important part of our human heritage and offer the greatest imaginable panorama for us to admire.

initially gave rise to much controversy, has in fact been the one that has caused the least number of problems owing to the absence in both Tenerife and La Palma of potentially contaminating industries. So far, there have been no attempts to set up any kind of industry above 1500 metres.

Nineteen years have passed since the publication of the Law Protecting the Astronomical Quality of the IAC Observatories and many problems have been resolved, such as the declaration concerning the protection of air space, but many other problems still remain to be sorted out, such as how to continue the campaign to protect the observatories from light pollution by adapting light fixtures. The IAC has initiated a way of understanding exterior lighting that has extended not only to national but also to international level. Suitable lighting means intelligent lighting, energy savings, the lessening of impact on the environment and clean