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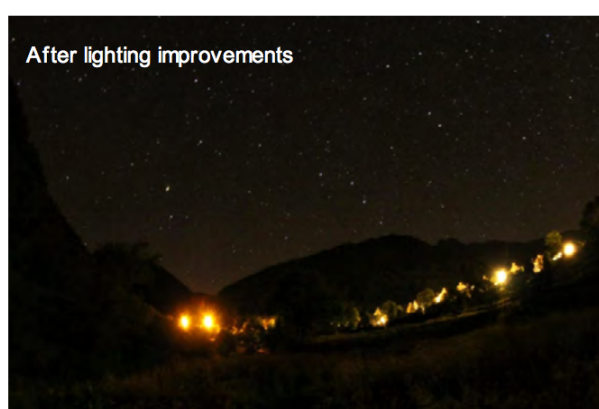
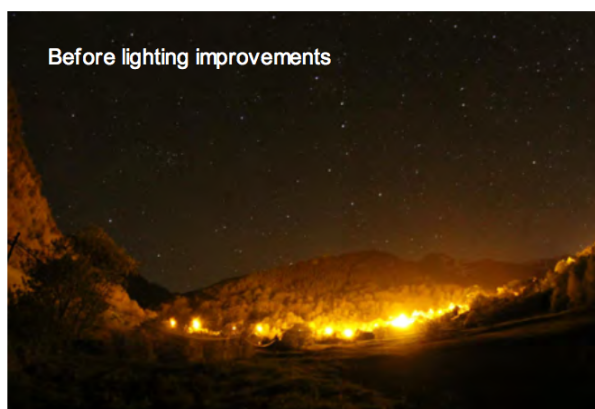
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Light Footprint Project AULON (France)

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Pic du Midi RICE/IDSR : Before and After Lighting improvements – For more details please see LMP part (Credits : Bruno Charlier)

Septembre 2013

A5 Improvement of lighting and promotion of actions and outcomes : example of the village of Aulon.



Aulon and the sign of the Starry Sky Programme, after the improving of lighting in august 2013 (Credits: Nicolas Bourgeois).

This section presents the aim of the Dark Sky Programme through the example of a concrete case: improving the lighting of the village Aulon and trying out the "Light Footprint" operation.

The "Light Footprint" operation gave us the opportunity to realise two complementary objectives of the Dark Sky Programme on a local level: the R & D (research and development) and the lighting diagnosis. It has allowed us to measure the results of the application of our lighting guide.

We will first present the village of Aulon in context, then the Light Footprint operation in outline, and finally the results of the improvement in lighting, shown in figures and images.

A5.1 The village of Aulon in context.

Aulon is a village in the south-west of the Pays des Nestes. It has a number of particular characteristics; we have selected those related to our subject.

The village is located at the bottom of a small yet steep-sided valley standing at nearly 1,200 metres. This results in a certain isolation which becomes especially complicated in the winter due to avalanches that sometimes block the only access road for several days. Nevertheless, this village remains animated and boasts some notable achievements, in part due to the local political will and the presence of a hydroelectric plant on the perimeter of the town.



Aulon by night, before the improving of its lighting (Credits: Lea Salmon).

Although isolated, the village has a population of 80 inhabitants and is equipped with a street lighting network which is far superior to the average for a town of the same size. Indeed since the late 80s, Aulon has possessed 55 bright spots, which gives an average of 0.7 percentage spots/inhabitant.

In the 2000s, the village of Aulon engaged in a process of reducing its environmental impact and continues to do so in order to preserve the natural Pyrenean habitat.. It is thus that the Aulon Regional Nature Reserve was born in 2011.

With the formalisation of the Pic du Midi IDSR project, improving lighting in the village of Aulon was considered by the mayor an essential factor in reducing its impact on the nocturnal environment. In January 2012, Aulon sought the help of the SDE 65 and the Pic du Midi to put together a project on efficient, sustainable, low pollution lighting.

A5.2 Aulon's lighting in a few figures.

Technical Aspects :

- 50 bright spots with High Pressure Sodium lamps
- Lamps ranging between 100 watts and 150 watts
- Unprotected old-generation style lamps, with visible light in opaline bowls.
- Ferromagnetic ballast
- 30 to 35% luminous flux emitted outside the working surface

Functions :

- No timed/curfewed lighting
- Bad positioning of spots used to enhance and light up the church
- Some bright spots caulked to reduce intrusive lighting



Aulon by night, before the improving of its lighting (Credits: Lea Salmon).

A5.3 The "Light Footprint" Operation in Aulon.

In February 2012, the Pic du Midi was contacted by a student in the 2nd year of her Masters degree in "Ecology and Sustainable Development" at the *Université Catholique de l'Ouest* (the Western Catholic University), wishing to do an internship on the topic of light pollution. This study provided a very good opportunity to develop and test a protocol study and modelling of light pollution and its impacts.

The village of Aulon took immediate interest in the study and established a partnership with the Pyrenees National Park and the Pic du Midi in order to finance the student, Léa Salmon-Legagneur. The study was conducted in Aulon from March to August 2013 with the support of a large number of specialists involved in the environment and light pollution. We can mention Martin Aubé Cegep of Sherbrooke, the Mont Mégantic IDSR, Licorness Observatory amongst others...

We will only present the main principles of the operation as it will shortly be the subject of scientific articles and the report of Léa Salmon-Legagneur's study will be posted on the future Pic du Midi IDSR website.



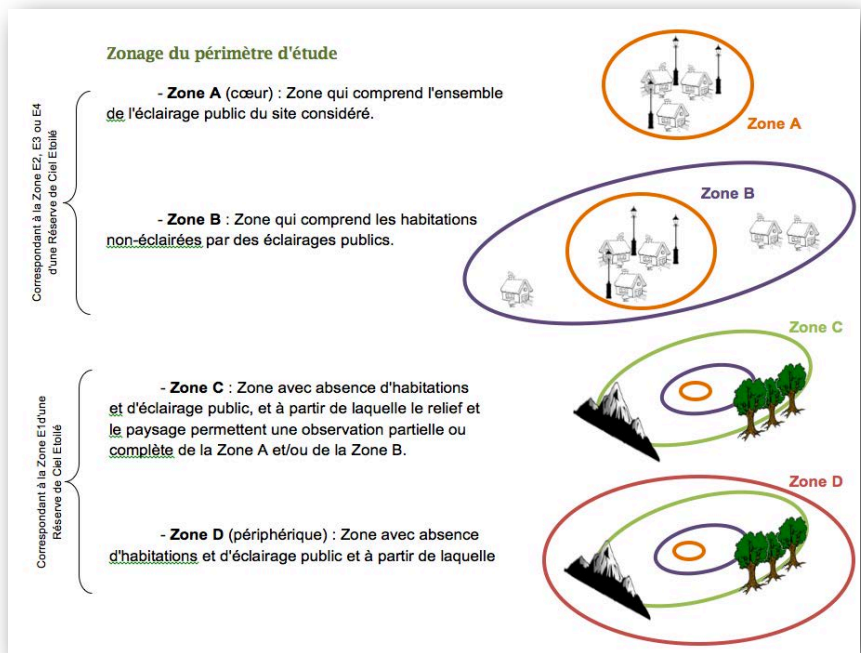
Extinction operation in Aulon, for Light print, june 2013 (Credits: Nicolas Bourgeois).

The main principles of the "Light Footprint" operation :
BEFORE LIGHTING IMPROVEMENTS in Aulon

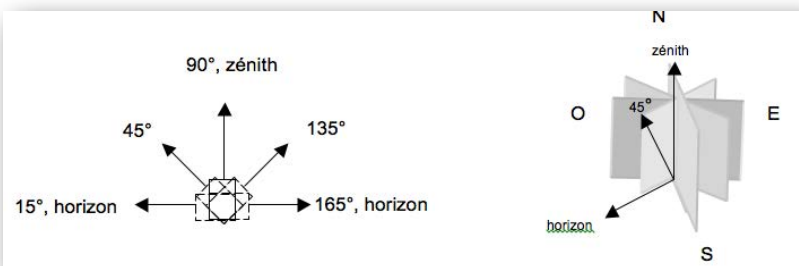
-status and diagnosis of the initial lighting park in Aulon.

-establishment of photographic and SQM measurement protocols for modelling light pollution:

-mesh of measurement points on a specific zone.



-multi-angle SQM measures.



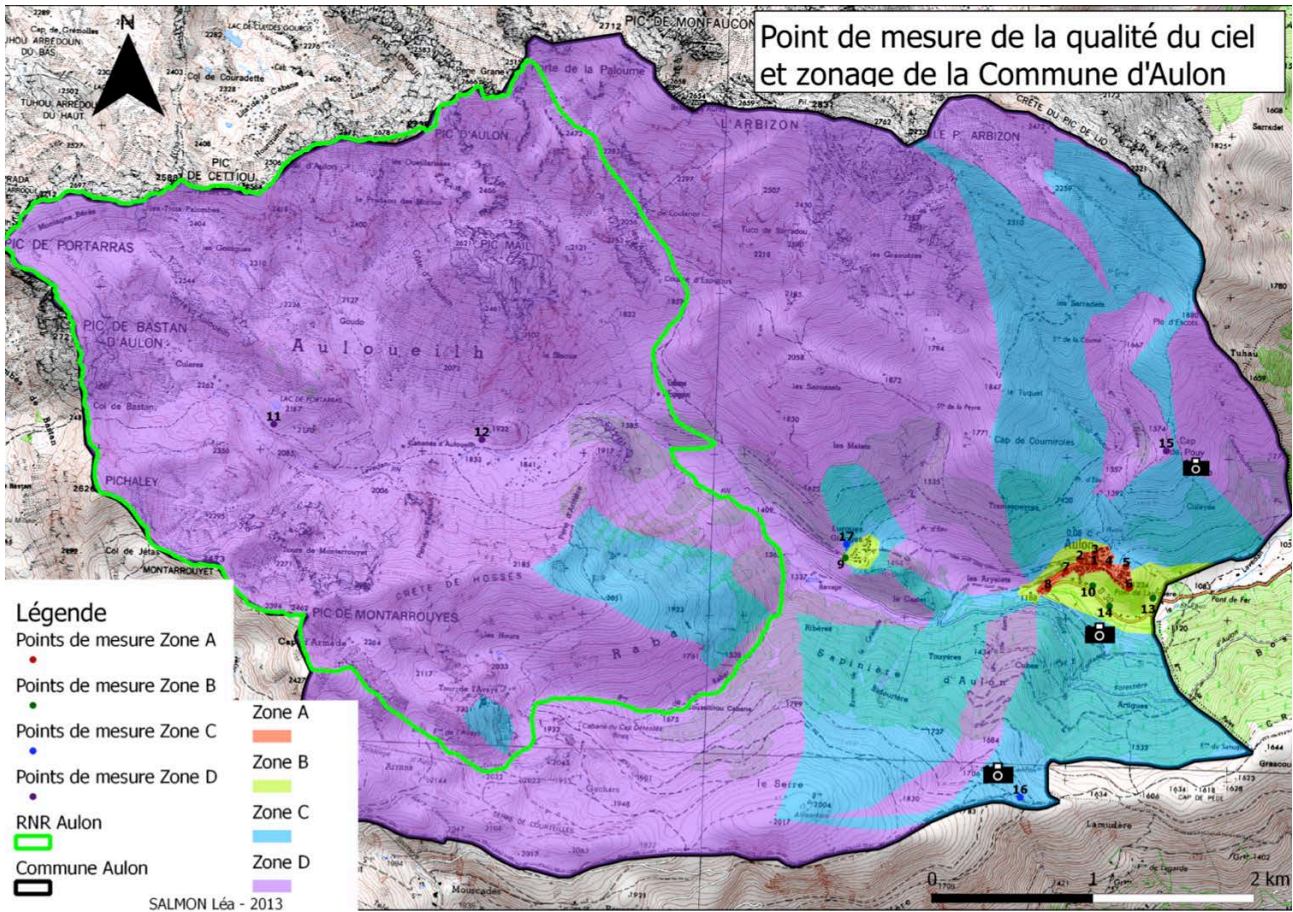


-use of SQM-L for participants and SQM-L Data Logger for continuous and automated measures.



- shooting various specific areas with a digital SLR camera

-experimenting with the measurement protocols before and after the village lights are turned off.



Zoning map for SQM measurements (Credits: Lea Salmon).

AFTER LIGHTING IMPROVEMENTS in Aulon

- status of the new lighting based on the Pic du Midi lighting guide.
- repetition of the photographic and SQM measurement protocols.
- photographic and SQM data modelling.

The "Light Footprint" operation is an ideal opportunity to obtain an overview before and after lighting improvements have been made and indeed to measure the consequences of the Dark Sky lighting.



A5.4 The outcome of the lighting improvements in Aulon, shown through figures and images.

The lighting improvements in Aulon are entirely based on our lighting guide. The essential criteria for efficient, sustainable, low pollution lighting have been met thus:

- direction of the luminous flux
- spectral-quality light with limits on weak wavelengths
- lamp adapted to the lighting category
- light levels are frugal and adapted
- timed lighting
- light efficiency

The project consists of the following:

-replacing 40 lamps (old-generation style lanterns) with new generation lanterns with high photometric performance which are both solid and waterproof.

-replacing 100 watt high pressure sodium lamps with metal iodide 60 watt lamps with a low proportion of blue.

-timers with voltage lowered by 35% in the second half of the night and soon to be turned off completely.



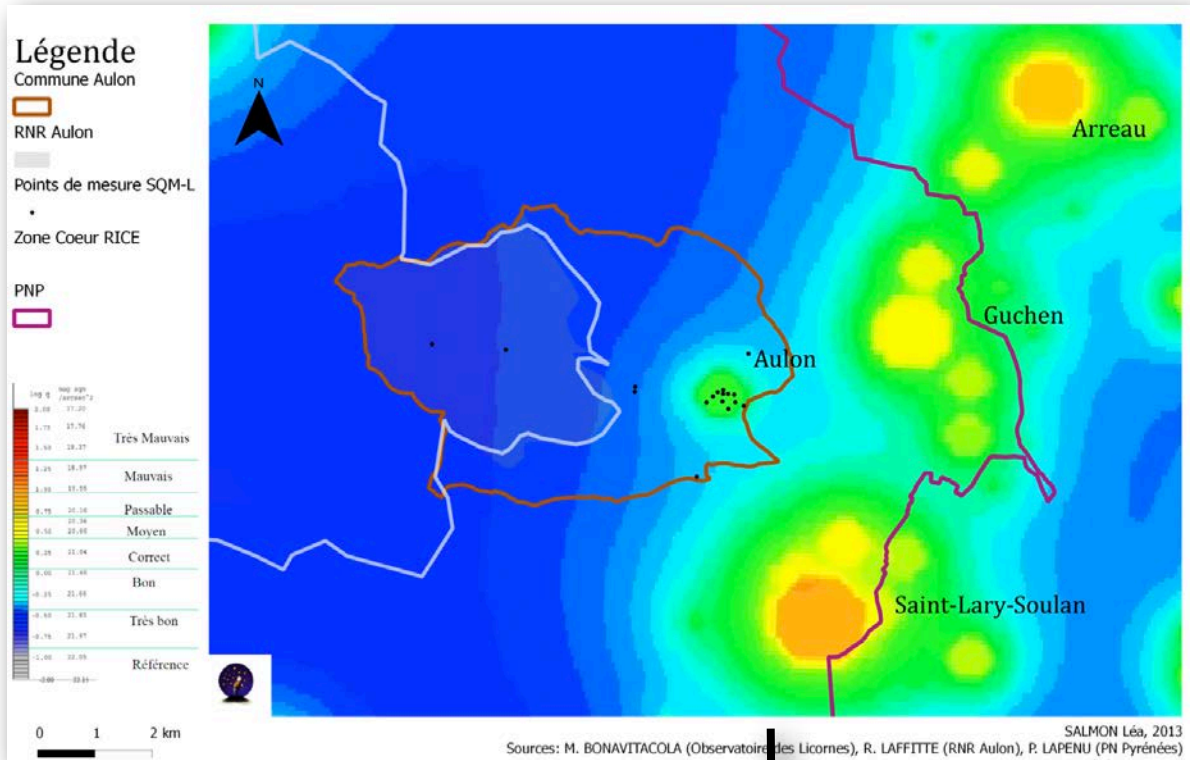
Lantern legacy, no standard for the IDSR (Credits: Lea Salmon).



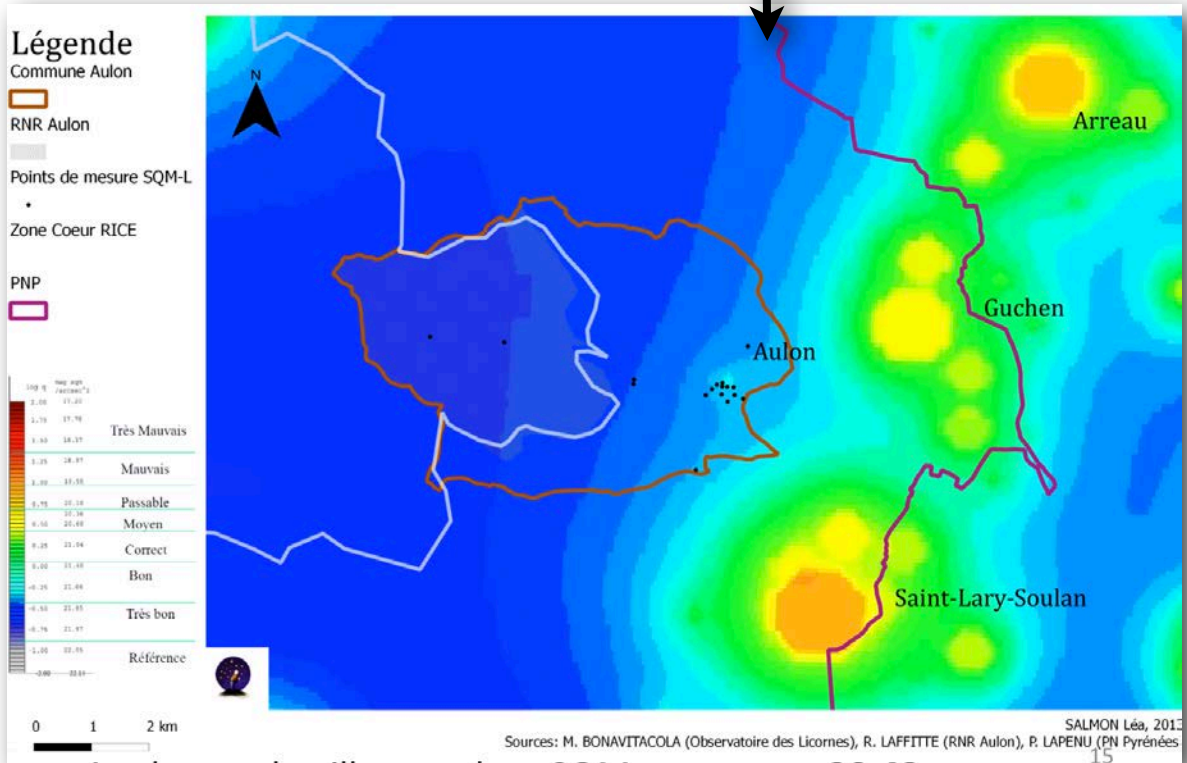
New generation of lantern, standard with the Lighting Guide of the Pic du Midi RICE/IDSR (Credits: Lea Salmon).

The outcome :





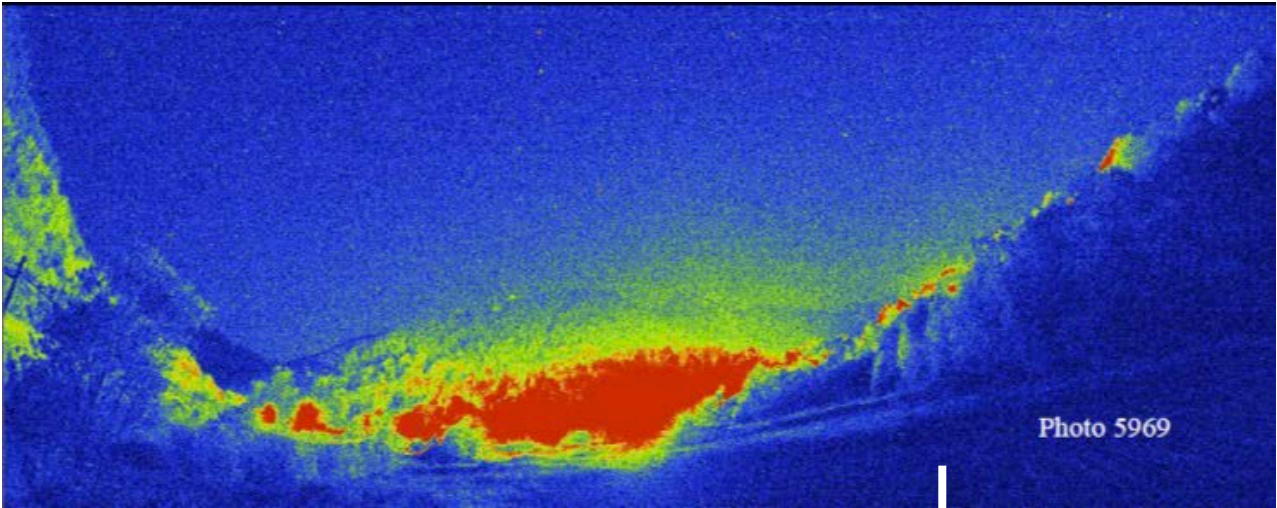
Light pollution modelisation by Michel Bonavtacola: before and after the lighting improvement of Aulon (Credits: Michel Bonavtacola).



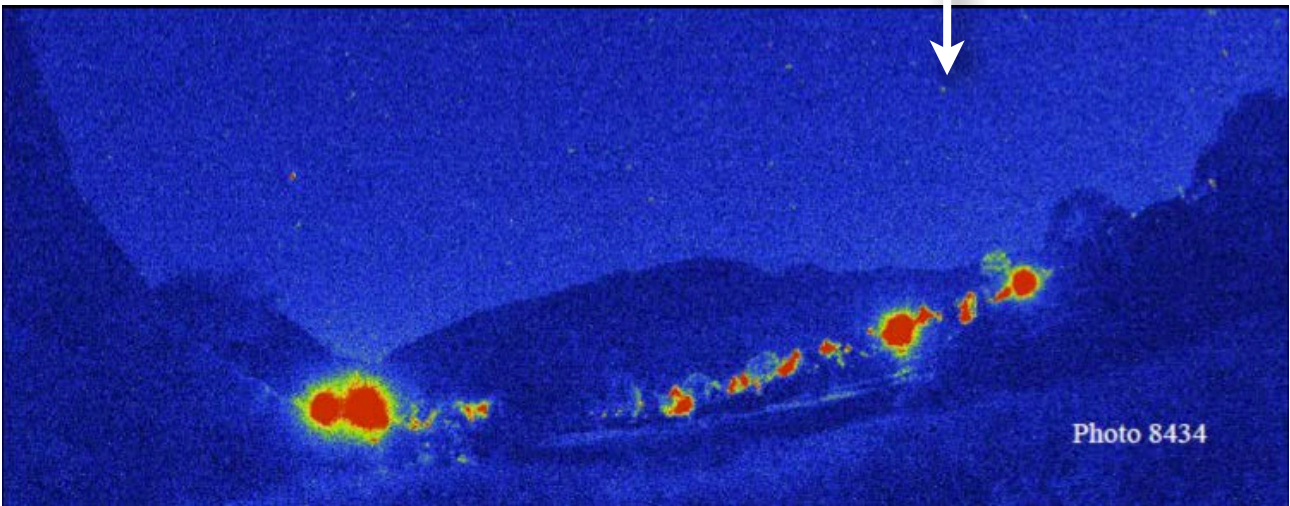


Before and after the lighting improvement of Aulon (Credits: Bruno





Light in false color : before and after the lighting improvement of Aulon (Credits: Michel Bonavitacola).



Aulon is thus the first town to experience and apply the entire Dark Sky Programme and now serves as a model to raise awareness and encourage other towns and villages in the Reserve. Since late August 2013, visits to Aulon have been organised by the Pays des Nestes. These are offered to elected officials and provide a good start to the Dark Sky Programme in that territory.