

## Light pollution from the ground, the air and the space

**A. Sánchez de Miguel<sup>1</sup>, J. Zamorano<sup>1</sup>, J. Gómez Castaño<sup>1</sup>, M. Aubé<sup>2</sup>, S. Bará<sup>3</sup>, J. Gallego<sup>1</sup>, C. C. M. Kyba<sup>4</sup>, D. Lombraña<sup>5</sup>, M. Nieves<sup>6</sup>, S. Pascual<sup>1</sup>, and C. Tapia<sup>1</sup>**

<sup>1</sup> Dept. de Astrofísica y CC. de la Atmósfera, Universidad Complutense de Madrid, Av. Complutense s/n 28040, Madrid, Spain

<sup>2</sup> Cegep de Sherbrooke, Sherbrooke J1E 4K1, Canada

<sup>3</sup> Área de Óptica, Dept. de Física Aplicada, Fac. de Física, Universidade de Santiago de Compostela, 15782 Santiago de Compostela, Galicia, Spain

<sup>4</sup> Deutsches GeoForschungsZentrum Potsdam, Telegrafenberg, 14473 Potsdam, Germany

<sup>5</sup> Crowdcrafting, Madrid, Spain

<sup>6</sup> Dept. de Física Atómica, Molecular y Nuclear, Universidad Complutense de Madrid, Spain

### Abstract

The sky brightness is one of the things that most harms astronomical observation, near cities and on mountain observatories. Currently there are several initiatives to control light pollution, but the sky brightness measurements are usually local. To exercise adequate control of light pollution is necessary measurements of light pollution sources and their relation to the spatiotemporal variation of the sky brightness. We use various approaches: data taken ashore with photometers SQM and relate emissions and detected with VIIRS and DMSP satellites. We also use multispectral data taken from the International Space Station to distinguish different types of lamps that contribute to light pollution. Finally we used a spectrograph SAND for temporal analysis of the evolution of the contribution of the lights in the sky brightness of a big city like Madrid. Also we have performed a citizen science program to classify the night time images taken from the ISS (Sánchez de Miguel et al. 2014, A&G, 55, 4, 36).