

EARTH OBSERVATION SYMPOSIUM (B1)
Poster Session (P)

Author: Mr. Hector Espinos-Morato
University of Valencia, Spain, hector.espinos@uv.es

Mr. Javier Navarro-Gonzalez
University of Valencia, Spain, Javier.Navarro-Gonzalez@uv.es

Dr. Pere Blay
University of Valencia, Spain, pere.blay@uv.es

Prof. Victor Reglero
University of Valencia, Spain, reglero.iac2006@uv.es

Mr. Paul H Connell
University of Valencia, Spain, paul.connell@uv.es

Dr. Chris J Eyles
University of Valencia, Spain, chris.j.eyles@uv.es

Mrs. Juana Maria Rodrigo Rodrigo
University of Valencia, Spain, Juana.M.Rodrigo@uv.es

Mr. Juan Macian
University of Valencia, Spain, juan.macian@uv.es

Mr. José Tomás Biosca
Spain, J.Tomas.Biosca@uv.es

MXGS-ASIM MISSION – OBSERVATION OF GAMMA RAYS FROM THE EARTH

Abstract

The Atmosphere-Space Interactions Monitor (ASIM) is an ESA mission which will be placed on the Columbus module on the International Space Station (ISS). ASIM will study the coupling of thunderstorms processes to the upper atmosphere, ionosphere and radiation belts and energetic space particle precipitation effects in the mesosphere and thermosphere.

The scientific objectives include inter alia investigations into sprites, jets, elves and relativistic electron beams injected into the magnetosphere above thunderstorms, lightning-induced precipitation of radiation belt electrons, ozone and NO_x concentrations in the upper atmosphere, and the characterization of the optical and high-energy emission related to severe thunderstorms.

In this sense, it is setting up a set of simulations in order to analyse the expected detections from the sensors of ASIM, in particular from the Modular X-ray and Gamma-ray Sensor (MXGS) imager. X- and gamma-radiation is a sign of ionisation in thunderclouds and ions are considered important for condensation of water vapor into cloud drops. The formation and development of thunderclouds are then affected by the electrical processes in the clouds.

For this purpose, on the one hand it has developed a mass model for its use in Geant4 applications to characterize the response of the instrument to the incident high-energy radiation, and the effects of background from backscattered photons from the Columbus module. On the other hand it was developing a set of atmospheric models to set up Geant4 simulations of electron avalanche and gamma-ray propagation, with emphasis on the possible residual optical emission due to interaction with atmospheric components, and the expected spectral and timing properties of the resulting high-energy emission towards space including comparisons with other software toolkits like CORSIKA or LEPTRACK (under

developed at the University of Valencia).

There are still no simultaneous observations of lightning, giant lightning and X- and gamma-radiation. ASIM will be the first dedicated scientific mission to try to observe all these at the same time.