Retrieval of Atmospheric Trace Gases Variability with Satellite Advanced IR sounders

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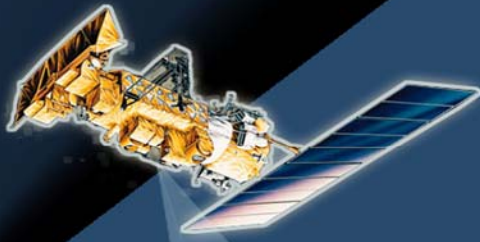[3]*QSS Group Inc.*
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We introduce a microwave 1D-VAR algorithm, MIRS (Microwave Integrated Retrieval System) used to simultaneously retrieve surface parameters and atmospheric profiles in all-weather conditions over a multitude of surface backgrounds. The MIRS is in its final development and validation stage and will become operational at NOAA in the near future. The final outputs of the algorithm depend on the sensor being processed and could include the humidity and temperature profiles, the cloud and precipitation profiles, the ground skin temperature and the surface emissivity spectrum. Natural by-products of these outputs include the total precipitable water (TPW), the vertically-integrated cloud liquid water amount (CLW), rain water path (RWP) as well as the ice water path (IWP). To permit a stable inversion, the retrieval is performed in reduced space for the atmospheric profiles including the cloud and precipitation parameters, and for the surface emissivity spectrum. This is achieved by performing an Eigenvalue decomposition of the covariance matrix. The forward operator used by MIRS is a version of the Community Radiative Transfer Model (CRTM), based on a two-stream approximation for the modeling of multiple scattering effects of clouds and precipitation. The algorithm is routinely applied to data from the NOAA-18 satellite with its two microwave sounders AMSU and MHS. It is also applied to DMSP-F16 SSMI/S and Coriolis-WINDSAT data. It is also ready to process data from the soon to be launched METOP satellite. General validation of the model outputs is presented by comparing the results of the retrieval to a number of sources considered as references: radiosondes, airborne GPS-dropsondes, ARM-based uplooking measurements, Global Data Assimilation System (GDAS) global analyses and heritage products from the Microwave Surface and Precipitation Products System (MSPPS) which have been thoroughly validated in the past. A special attention will be given to the retrieval in cloudy and highly precipitating conditions (hurricanes) because it represents a major added value of this system compared to existing ones.

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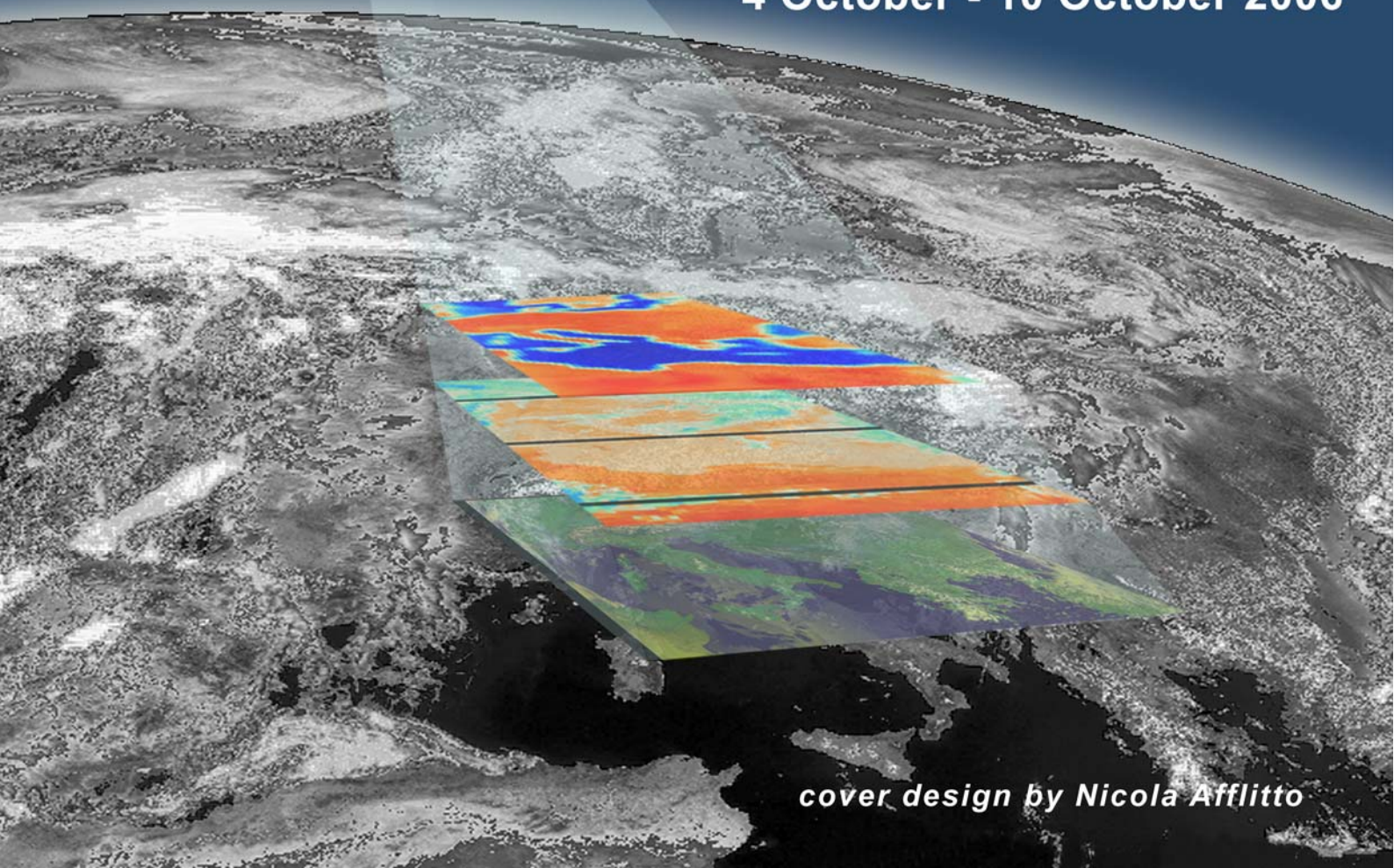
to study the earth's weather

using space-based observations

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