

The GEISA spectroscopic database 2015 edition in the frame of IASI remote sensing applications and IASI-NG phase B studies

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With the advent of instruments highly resolved spectrally since the beginning of the 2000's, minimization of the error due to the spectroscopy is more and more essential.

GEISA a computer-accessible Spectroscopic Database with associated management software, designed for the interpretation of various atmospheric remote sensing observations and especially efficient for high spectral resolved Radiative Transfer simulations.

GEISA and RELATIONS TO SPACE MISSIONS (examples)

Atmospheric sounding for scientific study: Meteorology, Climatology, Air quality, Chemistry, astrophysics, ... Current missions: IASI on Metop-A (2006), Metop-B (2012), Metop C (2018). GEISA reference basis for IASI Level 1 Central operations (cores and band). Requirements: 1) remote sounding of the atmosphere at high spectral resolution. FT spectrometers (IASI, IASI-NG), scanning spectrometers (MICROCARB), Lidars (MERLIN), 2) evolutions of the performances for Missions under exploitation, Missions under development.

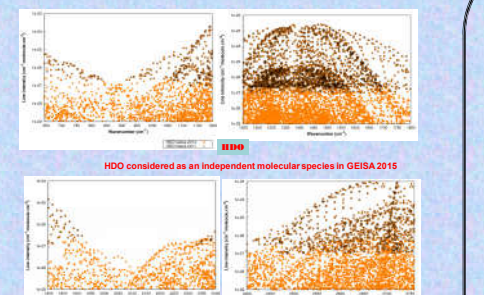
CURRENT GEISA SYSTEM (created in 1974) Contents and Organization

THREE INDEPENDENT SUB-DATABASES (associated management softwares): - LINE PARAMETERS: wavenumber, intensity, air broadening pressure half-width (HWHM), energy of the lower transition, quantum identification, temperature dependence of coefficient for HWHM, ... - ABSORPTION CROSS-SECTIONS: - in the IR (40 molecular species); - in the UVVIS (17 molecular species) - MICROPHYSICAL AND OPTICAL PROPERTIES OF ATMOSPHERIC AEROSOLS

DISTRIBUTION, VIZUALIZATION and TOOLS

Atmospheric Chemistry Data Center interface showing various data visualization tools and options for accessing the database.

IASI/IASI-NG Spectral Bands

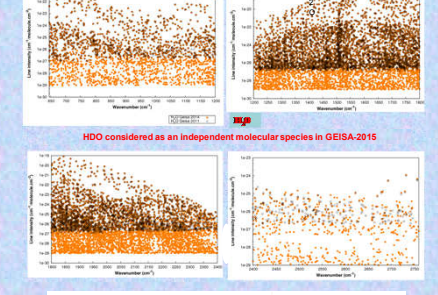


Summary of GEISA-2015 HDO Update table with columns for Wavenumber, Intensity, HWHM, EB, P-shift, and contributors.

GEISA 2015 UPDATED CONTENT

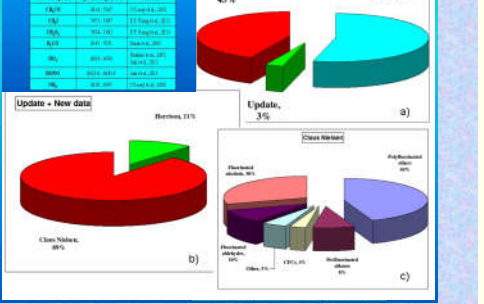
LINE PARAMETERS SUB-DATABASE (Evolution since 1978). Table listing Molecular Species, ID, and Contributors to GEISA-2015 update. Includes H2O, CO2, O3, CH4, SO2, NH3, HNO3, H2CO, O2, CH3, C2H2, C2H4, C2H6, HCN, C2H, C2H2, CH3Cl, HBr, CH3Br, HNC, HDO (NEW), SO2 (NEW).

IASI/IASI-NG Spectral Bands



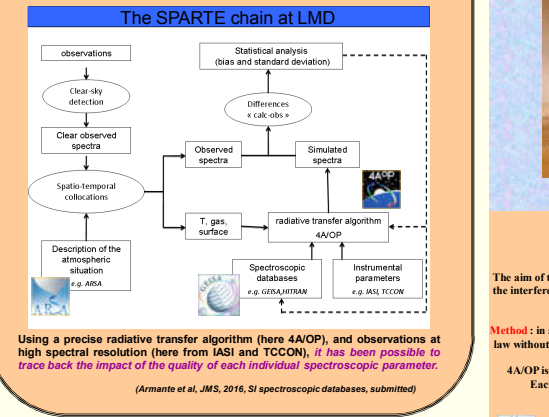
Summary of GEISA-2015 H2O Update table with columns for Wavenumber, Intensity, HWHM, EB, P-shift, and contributors.

ABSORPTION CROSS-SECTIONS SUB-DATABASE

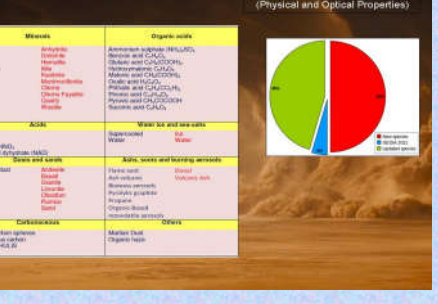


VALIDATION of GEISA

The main difficulty in interpreting differences between radiative transfer simulations and observations is to be able to separate errors coming from the different actors of the radiative transfer simulations. For example errors coming from the incomplete knowledge of the atmospheric state and those due to the modeling itself.



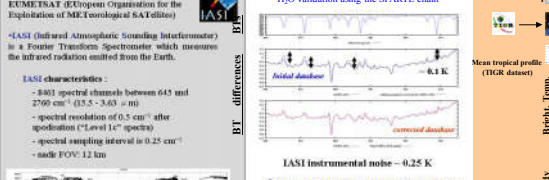
AEROSOLS SUB-DATABASE (Physical and Optical Properties)



Spectroscopic validations for the Ultraviolet Visible Near-infrared Shortwave instrument (UVNIS)

Ground-based data - TCCON network. Table showing CH4 position, intensity, HWHM, EB, P-shift for various instruments and dates. Includes text about HDO detection and CH4 line impacts.

The IASI instrument



Spectroscopic studies for the Infrared Atmospheric Sounding Interferometer - Next Generation (IASI-NG)

Example of the 6.3 µm band. Text describing the aim of the study to estimate the spectroscopic parameter needed for IASI-NG. Includes a graph of H2O extraction between 1585 and 1625 cm-1 showing intensity and HWHM profiles.