MIRAS : NEURAL ATMOPSHERIC COMPOSITION BY INFRARED ABSORPTION SPECTROMETRY IN SOLAR OCCULTATION

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MIRAS is a limb-sounding infrared high resolution spectrometer designed to fly as a payload of the MIR station, it will be flown in 1995 for a duration of one year, its design allowing a possible extended mission.

The MIRAS grille spectrometer will establish during a one year flight a complete monitoring of the neutral atmospheric composition using infrared absorption spectrometry in the solar occultation mode. The concentration profiles of at least 15 chemical species will be measured between the tropopause and the heterosphere. The 13 constituents which will be certainly observed are : O_3, H_2O, CO, CO_2, NO, NO_2, CH_4, N_2O, HF, HCl, HNO_3, N_2O_5 and OCS. Spectral intervals allowing observation of HCN and SO_2 will be also available. With the exception of ClO, this list includes the main stable species of the stratosphere and mesosphere that are chemically active.

The MIRAS results will lead to a better understanding of the interactions between solar radiation and atmospheric chemistry and dynamics. The MIRAS observation cycle, divided in polar, tropical and mid latitude campaigns corresponds to one calendar year, however, other cycles, observed in stratospheric winds and ozone columns variations as the quasi-biennial and semiannual oscillations are present and would call for an extended mission.

The year of observation will include two detailed campaigns of arctic and antarctic measurements designed to study the particular chemistry associated with the Sun's return after the polar night in order to understand the seasonal ozone diminution.

At all latitudes, the observation of CO_2, CO and H_2O at the homosphere-heterosphere transition will map the temporal and spatial variations of this boundary where gravity waves generated in the troposphere break. This observation is fundamental for the determination of the boundary conditions of the theoretical models of the middle atmosphere.

A general scientific programme extending to the entire earth must not be neglected, as new perturbations are to be studied in the frame of the extension of stratospheric transport aviation, stepped up operations of rockets and spaceplanes, the continued use of chlorine compounds for refrigeration and the growth of CO_2, N_2O and CH_4. The MIRAS results will furnish an invaluable data-base at the beginning of the study of these challenges.

Finally, the instrument operations must also be able to address pure geophysical events as Solar Proton Events, entry of cometary debris or volcanic explosions.

MIRAS by its stratospheric and mesospheric studies fits perfectly in the IGBP frame. Moreover, by its mapping of the lower thermosphere, it adds a new dimension to the understanding of the solar planetary relationships. MIRAS is the only project in the middle nineties addressing a global atmospheric balance for a period of one year.

References

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