ADVANCED ATMOSPHERIC PHYSICS PLATFORMS

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The upper atmosphere is traditionnally divided into different regions which have generally been observed separately, neglecting their various interactions between energy inputs, composition, dynamics and transport. Consequently, our knowledge of the atmospheric phenomena resulting from the solar-terrestrial interactions is still superficial. In addition there is a lack of global coverage for measurements in the middle atmosphere, the thermosphere and the ionosphere and, consequently, of the global view of the upper atmosphere considered as a whole coupled system.

The Challenge for the 1990's will be

1° to obtain a <u>global view</u> of the upper atmospheric physics driven by the primary source of energy, namely the Sun.

2° to improve our understanding of the radiative-chemical-dynamical processes that couple the components of the solar-terrestrial system.

3° to improve our understanding of the role of these processes in the <u>variability</u> of the solar-terrestrial system.

4° to monitor the long-term evolution of the coupled solar--terrestrial system.

The absorption of solar EUV radiation and, to a lesser extent, the energy deposition from particle precipitation in auroral zones, determine the dynamics and the composition of the global thermosphere and ionosphere. The temperature structure is directly driven by the balance between thermal energy due to EUV absorption and downward conduction of heat by molecular and atomic diffusion. In the lower thermosphere, the structure becomes more complex due to more important radiation losses mainly by CO_2 and NO, and the energy fluxes produced by turbulence and dissipation of waves generated from lower regions.

In the mesosphere, the temperature structure is a consequence of the radiative balance between solar UV absorption (for wavelengths larger than 175 nm and Lyman α) and infrared cooling by mainly ozone and CO_2. In addition, above 70 km of altitude, the radiation processes are not in LTE, involving many excited species which play an important role in the energetics of this part of the atmosphere.

These regions are of particular interest for studying couplings between energetics, dynamics and composition through the airglow emissions and the light scattered by key species dynamically and/or photochemically controlled. The altitudes and the latitudes for which one process becomes predominant depend upon species and seasons.

The atmospheric emissions and light scattering arise over an altitude range which extends from ground to the exosphere. The least understood region is the upper mesosphere and the lower thermosphere. Therefore, the primary objective for atmospheric studies in the next decade has to be concentrated on this region. The principal scientific challenge is to understand the whole coupled system. It is for this reason that observations relevant to auroral ionosphere and magnetosphere are required at the same time within a well coordinated STP programme. The "Advanced Atmospheric Physics Platforms", including spectral measurements of atmospheric emissions in the ultraviolet, visible and near infrared and focussed on the odd oxygen family and the nitrogen compounds, consitute a basic tool in understanding the physical and chemical coupling mechanisms initiated by the primary source of energy, the Sun, which controls much of the deposition of energy into the geosphere-biosphere system.