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# Towards a Self Consistent Model of the Thermal Structure of the Venus Atmosphere

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## Abstract

An International Team has been formed under the International Space Science Institute (ISSI), Bern, Switzerland to consider results on the thermal structure of the Venus atmosphere obtained from space missions and ground based observations since the Venus International Reference Atmosphere was developed [1] and to arrive at a self consistent model of the atmospheric structure – temperature and density with altitude/pressure from the available results.

## 1. Introduction

Thermal structure of the deep atmosphere of Venus, extending nearly two hundred km above the surface, is a result of the radiative and convective processes which are governed by the scattering and absorption of the incident solar radiation and of the infrared emitted radiation from the surface and the atmosphere itself. The radiative balance is influenced by the atmospheric composition and of the clouds and aerosols present in the atmosphere [2]. Thus understanding the structure of the Venus atmosphere in a mean state as well as short and long term variations require a good knowledge of the thermal, chemical and cloud/aerosol properties as a function of latitude-longitude and altitude. The first detailed model of the Venus atmosphere was published in 1985 [1] from synthesis of the results from Pioneer Venus Orbiter and Probe missions and Venera entry probe experiments [2]. Since then the extended phases of Pioneer Venus, ground based observations and other space missions such as VeGa [3], Venera 15/16 [4], Galileo [5], and Magellan [6] Since then several experiments on Venus Express –VeRa [7] , SOIR [8], SPICAV [9], VIRTIS [10] experiments have been obtained on the thermal structure. Orbiter experiments using accelerometer [11] and atmospheric drag [12] have also obtained results on the density structure of the upper atmosphere. Many ground based observations using CO spectral lines have also been obtained [13, 14, 15] The team will consider these results and address the following items:

- The cyclostrophically balanced flow of the atmosphere in the altitude range 40 – 170 km and better identification of its breakdown above ~ 80 km where temperature gradient reverses.
- Tabular compilations of the vertical and latitudinal structure of the temperature in the Venus atmosphere as a function of altitude as feasible from the available observations and guidance from the atmospheric models.
- Solar thermal tides – amplitudes and phases
- Any relationship between the thermal structure and $SO_2$ abundance and cloud/aerosol properties (being addressed through separate ISSI International Team proposals).

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