Present status of Atmos-B1 program

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The Atmos-B1 program is the execution plan to make it clear the earth radiation budget and the related cloud/aerosol behavior in the climate study. The Japanese radiation community has discussed it for several years in the "Cloud-Aerosol-Radiation budget Science Team" and others. It is well known that cloud has a very important role in the earth-atmosphere climate system. In order to understand the cloud/aerosol effect on the climate system, especially cloud-radiation interaction and/or the feedback mechanism, it is important to know not only the micro-physics and optical characteristics but also the horizontal and vertical distribution of cloud, especially three-dimensional structure of cloud. ISCCP program under WMO is one of these activities. As for the radiation budget of the earth-atmosphere system, a satellite-borne sensor such as ERBE was successfully performed for the top of the atmosphere, but we have no way directly to get information under cloud using any passive remote sensing techniques so that active sensors such as lidar and radar is being intorduced to achieve the objectives.

In this presentation, we will have a brief introduction of Atmos-B1 program and then show some preliminary results simulating our satellite plan. Figure 1 shows the sensors proposed in the Atmos-B1. The combined system with active and passive sensors are powerful and useful to get information of cloud in detail, especially 3-dimensional structure of cloud. In this simulation, only active sensors, lidar and cpr, are selected, as a first step, to show feasibility and usefulness of Atmos-B1. The atmospheric condition to be used is real and based on ECMWF re-analysis data. Figure6 shows the preliminary results of lidar and cpr on the upper two panels. The combination of both two active sensors are very powerful and efficient to know 3-dimensional cloud structure. The science team goes forward to accomplish the simulation of this program to clear the feasibility of Atmos-B1 plan.

Acknowledgements

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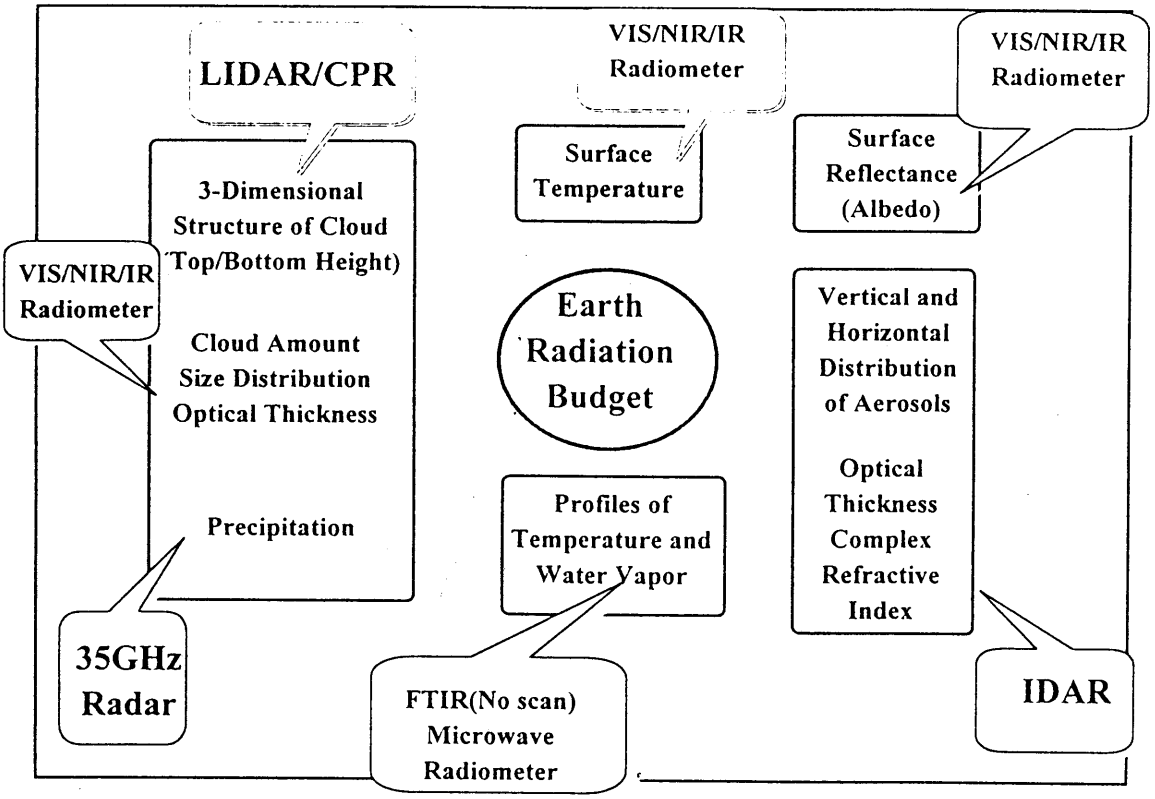

Figure 1: Relation between unknown parameters to be observed and related sensors to be proposed.

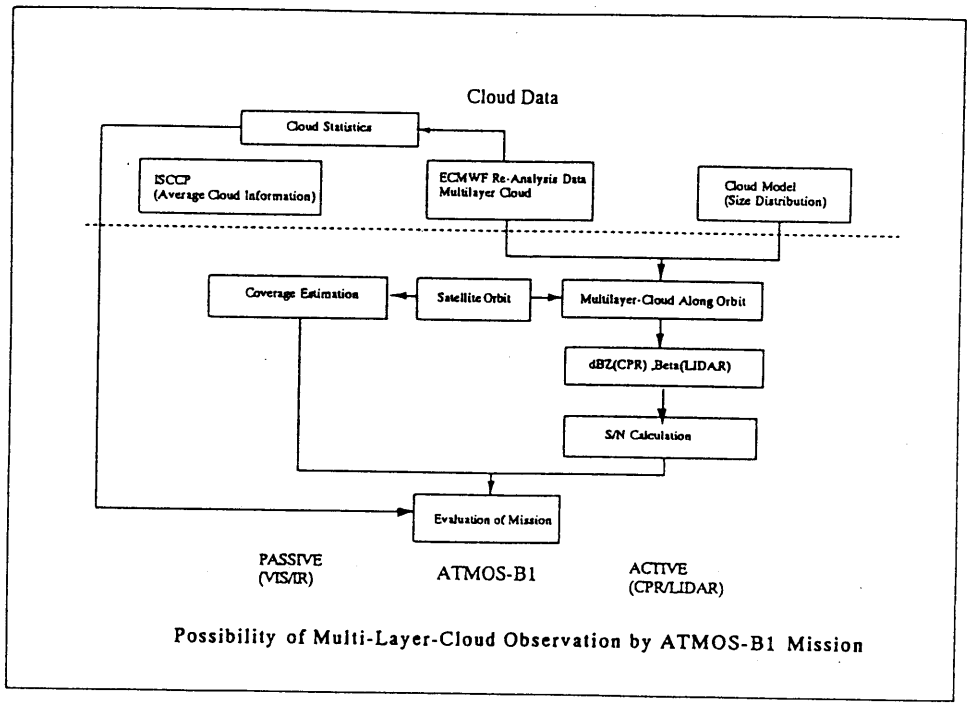

Figure 2: Schematic flow of the simulation of Atmos-B1.

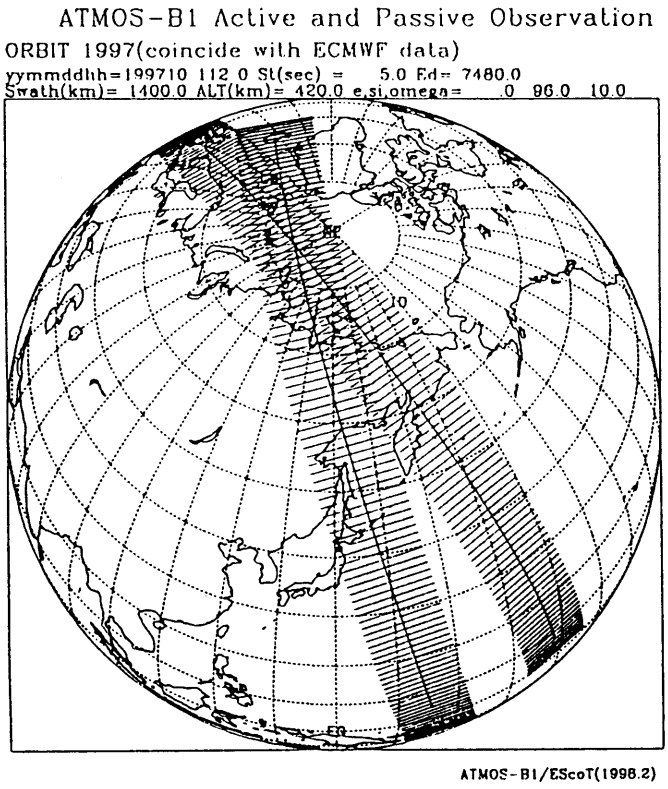

Figure 3: Sample of orbit of Atmos-B1. The solid line from the equator to the north shows the satellite track and nadir-looking sensors. The group of short lines across the satellite track means the swath of passive sensors.

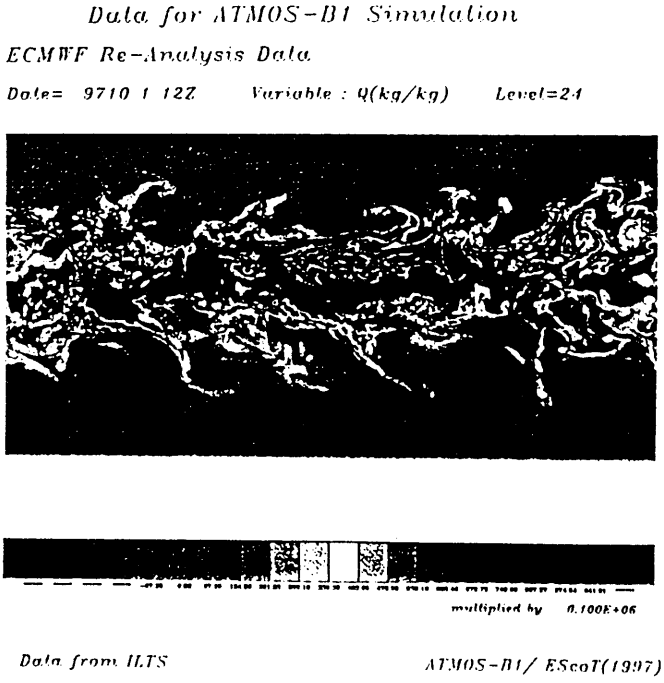

Figure 4: Global map of specific humidity on Oct 1, 1997 at level 24(about 3 km over ocean) of the p-sigma hybrid coordinate. The frontal systems are remarkable at the southern mid-latitude belts.

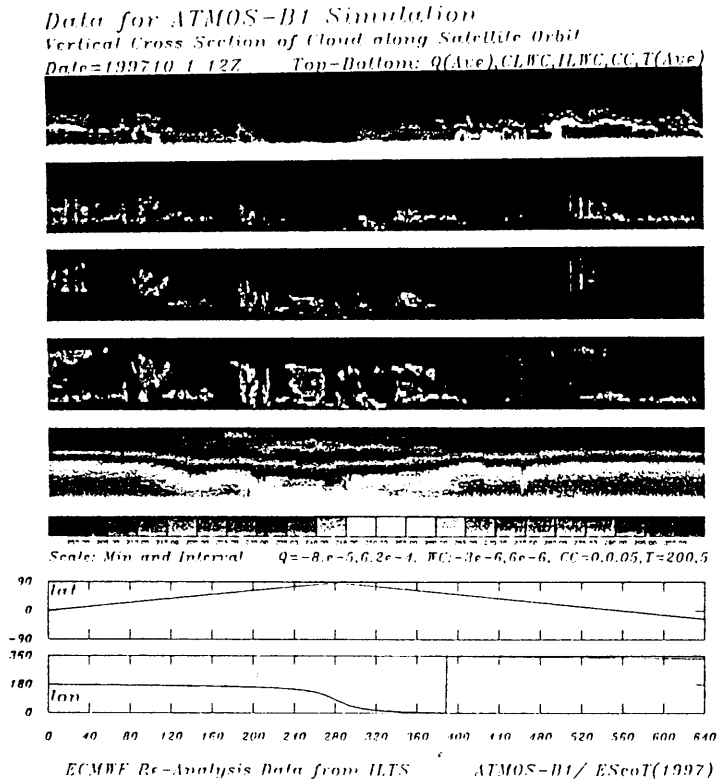

Figure 5: Vertical cross section of humidity, cloud liquid/ice water content and temperature during 3200 seconds after lifting up at the equator shown in Fig. 1. Lower two panels show the position of the satellite for latitude and longitude.

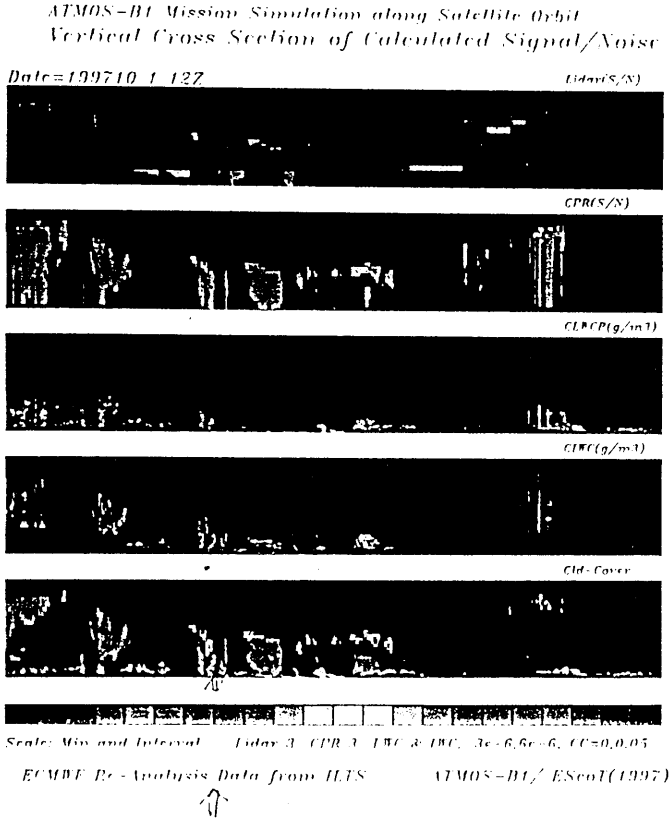

Figure 6:Preliminary results of the simulation. Upper two panels shows the vertical cross sections of simulated S/N over 3 for lidar(upper) and cpr(lower), respectively. Lower three panels show the cloud liquid/ice water content, and cloud cover from upper to lower.