

To: The Executive Net -- C778 Community Conference
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PROVOCATIONS -- #25
Space Measurements and the Greenhouse Effect

Early this month five scientists at our National Center for Atmospheric Research were on pins and needles as astronaut Sally Ride deployed the "Earth Radiation Budget Satellite" called "ERBS" for short. ERBS was having mechanical trouble at first because of the extreme cold, but after a few hours warmed up, and was successfully launched. It then began its slow ride to its final orbit. Soon it will, we hope, begin sending data back. Our group, along with others from other institutions, will then start an exciting series of analyses.

V. Ramanathan, whom we nickname "Ram", considers it one of the most important NASA programs of the decade. What ERBS does is to measure the energy gains the earth gets from the sun, and the energy losses the earth sustains to space through infrared radiation. In other words, it measures the earth's energy budget--its income and expenditures.

This is, of course, just what we need to know to assess the greenhouse effect of carbon dioxide and the "other gases" that I described in Provocations #20 and #5. The reason the measurement is hard to make is that clouds reflect a large fraction of the incoming sunlight back to space, and this loss varies by huge amounts depending on the number, character and distribution of the clouds. If a change in earth temperature occurs, thus, it is hard to tell if it was from cloud changes or from greenhouse heating from man-made carbon dioxide and other gases. Indeed it could even be caused by man-made clouds, like the thin cirrus that often builds up in the wake of jet airplanes, the "contrails." Up till now, we know that the clouds exercise a very large influence, but we have only the most primitive idea of the detailed quantities and their time trends.

Ram points out that ERBS sorts out these things by observing the earth continuously in the wavelengths of sunlight and in the infrared, and also observing the sun directly. Shortly the NOAA TIROS-N satellite, with the same instruments on board, will go up and assume a polar orbit. The ERBS orbit sweeps along within 57 deg north and south of the equator. Between the two, we will be able to piece together a complete world picture of the radiation budget. Then we should be able to observe the greenhouse effect, instead of simply inferring it rather indirectly from theory and from earth temperature measures that are influenced also by a host of other things.

If all goes well, the NCAR group and the others will get their first peek at the ERBS data tomorrow!
