# ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

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## Stratospheric-Tropospheric Exchange Processes

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Professor Holton described his experiences as a theorist chairing a US working group to set up experiments using aircraft to study stratospheric-tropospheric exchange processes. He pointed out that because of the small scales involved satellites are not appropriate for such investigations and thus a combination of U2 and Lear jets was used.

The scientific importance of tropospheric-stratospheric exchange processes was discussed in some detail. In particular, their relation to mass budgets for stratospheric and tropospheric chemicals, such as oxides of hydrogen, nitrogen and chlorine as well as aerosols and ozone; and to understanding potential vorticity transport were considered. Important exchange mechanisms mentioned were radiatively driven mean meridional motion, synoptic scale eddies, including upper level fronts, and small scale motions such as gravity waves and turbulence.

Since one of the principal active exchange regions is the inter-tropical convergence zone, the experiments were carried out in the Panama Canal zone during summer. Measurements of a large number of chemical constituents were made in addition to meteorological measurements of temperature, pressure, winds, humidity and cloud cover. As well as making a detailed study of atmospheric chemical constituents, it was hoped that the experiments would be able to determine why the stratosphere is so dry and in particular to test the Brewer-Dobson freeze-dry hypothesis. Unfortunately the experiments raised more questions than they answered. It appears that there is as yet no valid explanation of why the stratosphere is so dry; and the Brewer-Dobson hypothesis does not appear to be entirely consistent with the data.

The experiments also found large amplitude gravity waves of approximately one kilometre vertical displacement at fifty five thousand feet. The possible role of such waves in producing irreversible mixing was discussed.

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