

THE UPPER TROPOSPHERE/LOWER STRATOSPHERE: IMPROVEMENTS IN OUR UNDERSTANDING

WEDNESDAY 18 OCTOBER 2006

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The Antarctic ozone hole from discovery to present day: Mr Jonathan Shanklin,
British Antarctic Survey j.shanklin- at -bas.ac.uk

The existence of the ozone layer was discovered by astronomers in the 19th century. By the mid 20th century the basic mechanism for its creation was understood and chemicals that could destroy it had begun to be fabricated.

A few decades later ozone levels over Antarctica had declined by a detectable amount and the details of this discovery were published in Nature. The Montreal Protocol and its extensions have stopped the increase of ozone destroying substances in the atmosphere, nevertheless this year has seen a record breaking ozone hole.

<http://www.antarctica.ac.uk/met/jds/ozone/index.html>

A lagrangian perspective of the tropopause and the ventilation of the lowermost stratosphere: Dr Gavin Esler, University College London gavin- at -math.ucl.ac.uk
Trajectories driven by large-scale analysed wind fields are used to investigate troposphere to stratosphere transport in the tropopause region. The proportion of those trajectories arriving in the tropopause region that have visited the boundary layer within the previous 30~days is calculated as a function of potential temperature and equivalent latitude. This proportion is found to have a sharp gradient in the extratropics on potential temperature surfaces in the range 300-380K, i.e. it traces out the barrier to mixing associated with the tropopause. A quantitative comparison of the seasonal evolution of the tropopause barrier to transport, as well as its variation with height is made possible. The ultimate sources for transport to the lowermost stratosphere, defined in terms of the locations where each trajectory last left the atmospheric boundary layer, are also investigated.

<http://www.atm.amtp.cam.ac.uk/people/jge1000/>

Laboratory studies of the chemistry and photochemistry of the UTLS: Prof Andrew Orr-Ewing, University of Bristol A.Orr-Ewing- at -bristol.ac.uk

Our understanding of the chemical composition of regions of the Earth's atmosphere such as the upper troposphere (UT) or lower stratosphere (LS) is derived from a combination of in situ measurements, computer models, and laboratory experiments. The focus of this talk will be on the contributions that are made by laboratory studies, with examples drawn from recent work on photochemistry of organic molecules, rates of reactions of peroxy and hydroxyl radicals, mechanisms of oxidation of organic compounds, and heterogeneous chemistry on aerosol particles. Such measurements provide data on reaction rates in the gas phase and at surfaces, and values for photochemical quantum yields and cross sections. The impact of new laboratory measurements on predicted abundances of key atmospheric constituents such as ozone in the UTLS region will be illustrated.

<http://www.chm.bris.ac.uk/staff/aoewing.htm> and
<http://www.chm.bris.ac.uk/pt/ajoe/index.htm>

Results from recent field campaigns: Prof Geraint Vaughan, University of Manchester geraint.vaughan- at -manchester.ac.uk

The talk will attempt to summarise results from a number of field campaigns funded by the UTLS Ozone programme and other sources during the past eight years. This has been a period when considerable attention has been paid to the UTLS region and much progress made.

Three areas in particular will be discussed:

- Formation of filaments and layers in the UTLS by breaking Rossby waves
- Turbulence and Mixing in the midlatitude UTLS
- Convection and the Tropical Tropopause Layer

<http://www.seaes.manchester.ac.uk/FindPeople/>