

Stratospheric Chemical and Aerosol Measurements and their Continuity

While the NAS Decadal Survey provides excellent guidance for new NASA and NOAA missions, it did not assess the situation that might occur if the execution of the various missions was significantly delayed or cancelled. In the case of monitoring stratospheric chemistry, the gap between EOS Aura and the Tier III stratospheric chemistry mission GACM will probably be 5-10 years. If this gap occurs there will be no satellite based global measurements of ozone depleting compounds during the gap period. The key species that needs to be measured is the trace gas HCl – the major stratospheric chlorine reservoir as seen in Figure 1.

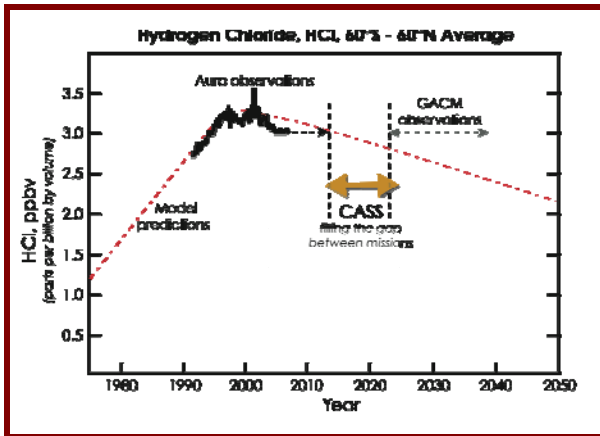


Fig. 1 The potential gap in chlorine measurements that would be covered by CASS as described below.

Another key capability not specifically addressed by the Decadal Survey is measurement of stratospheric aerosols. Stratospheric aerosol monitoring began with SAGE I in 1981 and NASA has almost continuously monitored stratospheric aerosol concentration from that point until 2006 when the SAGE III instrument on the Russian Meteor spacecraft failed. Using the SAGE II data, we have been able to quantify the climate impact of the 1991 Pinatubo eruption, for example.

The NPOESS/NPP Ozone Monitoring and Profiler Suite (OMPS) will make measurements of the ozone profile but will not be able to make measurements of aerosols or other ozone depleting trace gases.

To address the probable measurement gap in stratospheric chlorine and to restore the stratospheric aerosol measurement capability we propose a small, inexpensive joint USA/Canadian Mission. This mission would provide global monthly measurements of trace gases and aerosols in the stratosphere and upper troposphere in the gap period. The instruments on this mission have space flight heritage using the well understood solar occultation technique. The mission is called CASS – Chemical and Aerosol Sounding Satellite.

CASS proposed payload would use the ACE instrument from the Canadian Space Agency and the SAGE III instrument built by NASA. ACE instrument is currently flying on CSA's SciSat and the Canadians would provide a copy. CASS would also use the SAGE III instrument that was designated for the NASA Space Station but never flown. The SAGE III instrument would be refurbished. The ACE instrument would provide measurements of almost all the stratospheric trace gases relevant to ozone destruction. The SAGE instrument would provide measurements of stratospheric aerosol extinction. Both ACE and SAGE III would measure ozone profiles at high vertical resolution. The CASS satellite would be launched into a 57° inclination orbit for maximum global coverage – which takes about a month using solar occultation methods. To cover the measurement gap this relatively inexpensive mission (\$2-300M) should be launched about 2013-15. - Mark Schoeberl NASA/GSFC

