ALISS - Atmospheric Limb-Sounding Satellite for the UTLS Region

NCEO/CEOI-ST JOINT SCIENCE CONFERENCE 2014

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ALiSS

- Canadian-Swedish satellite mission for the UT/LS
- Two core instruments: CATS and STEAMR
- Potential UK partnership: (STEAMR, µFTS)
- Concept study ongoing; Launch target 2021







Canadian Atmospheric Tomography System

Stratosphere Troposphere Exchange And Climate Monitor Radiometer UV/VIS limb scattering. O_3 , NO₂, BrO, Aerosol extinction, Cirrus cloud optical depth. Mesosphere mode.

RAL Space

Sub-millimetre-wave limb sounder. O_3 , H_2O , T, N_2O , HNO_3 , CO, CH_3CI , CH_3CN , HCN, CLO, HDO

UT/LS Region is Important

- Climate Feedback
 - Rad. forcing
 - Greenhouse
 - Clouds
 - NWP / ESM
- Strat. Chemistry
 - Pollutants
 - ST Exchange
- Dynamics



RAL Space



STEAMR: Designed for Optimal UT/LS Observation Capability

- Sub-millimetre-wave instrument for cloud penetration and day/night observation.
- 300-360 GHz window for lowest tropospheric opacity and coverage of all core target species.

RAL Space

- Antenna array for high vertical/horizontal resolution.
- Ideally: Sideband separation for tropospheric channels to mitigate spectral confusion from heterodyne detection. → SHIRM receivers.

SHIRM Receivers – Cheating the Heterodyne Conundrum

SSB : Better retrievals, but more receivers per band.
→ fewer receivers available in antenna array

RAL Space

DSB: Worse retrievals, but fewer receivers per band.
→ more receivers available in antenna array



Field-Test of SHIRM Receiver at Jungfraujoch (3.5 km)



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StratoClim 2016

STEAMR demonstration from M55 "Geophysica" by means of MARSCHALS upgrade to SHIRM / WBS receivers.





ALiSS Benefits the UK

NCEO

- Improved knowledge of UTLS composition
- Improved understanding of STX processes
- Develop UTLS modules for Earth system models (UK community)
- Feedback to Climate models and NWP

CEOI

 Development of novel receiver technology (SHIRM, RAL)

RAL Space

- Development of UK spectrometer (WBS, STAR-Dundee)
- Raise TRL levels for future space applications
- Establish lead in SHIRM technology



- Understanding the UTLS is crucial in understanding and predicting Climate
- The 300-360 GHz window targeted by STEAMR is ideally suited to measure in the UTLS
- Multi-national satellite mission ALiSS to include STEAMR for targeted launch in 2021
- UK helped shape the STEAMR concept through CEOI and NCEO, and hopefully will become a full partner (UKSA negotiations with CSA and SNSB)