

Mesospheric Doppler wind measurements from Microwave Limb Sounder (MLS)

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This paper describes a remote sensing technique of mesospheric winds using the Microwave Limb Sounder (MLS) instrument on NASA Aura satellite. By measuring the Doppler shift of the 118-GHz O₂ emission lines, MLS can determine the line-of-light (LOS) wind speed to ~ 15 m/s in precision with a high-resolution (100 kHz) spectrometer in 1/6 second integration. The instrument performance is extremely stable during the 1.5-year operation since July 2004, which allows us to construct a fast radiance model empirically to retrieve Doppler shifts of the 118 GHz lines on a daily basis. Because Aura is a polar-orbiting satellite and the MLS LOS is in the forward direction of spacecraft velocity, the MLS winds are primarily the meridional component in the tropics and mid-latitudes, and winds derived from the northward (ascending) and southward (descending) tracks are out-of-phase. Preliminary wind retrievals show good Doppler sensitivity with the MLS instrument. During January and June-August 2005, strong 2-day wave oscillations are observed in the MLS LOS winds, which is found to be consistent with the wind wave amplitude measured by the TIDI instrument on TIMED during the same period.