ID: MLTG-9 **CEDAR 2023**





0. Science Questions What is the characteristics and distribution of gravity waves (GWs) in quiet-time (low Kp) thermosphere? 1. Goals & Motivation Determine the time, location and intrinsic parameters of thermospheric GWs observed by GOCE satellites. Determine the uncertainties (errors) of derived intrinsic GW parameters. Investigate the thermospheric GWs during geomagnetic quiet times. 2. GOCE in-situ measurements **Density and x-track wind** derived from 6 accelerometers Altitude: ~270 km • Velocity: ~7.8 km/sec Life span: 2009-11 ~ 2013-10 • Time resolution: 10 sec **3. Methodology** ellit North ↑ Sat. Q-I **Dispersion & polarization** relation of thermospheric GW (Vadas & Nicolls, 2012) \Rightarrow Complex function *G*: $-G_{arg}(\phi,\lambda_z) = PS(\tilde{\rho},\tilde{u}_{xtrack})$ $G_{mod}(\phi, \lambda_z) = AR(\tilde{\rho}, \tilde{u}_{xtrack})$ "PS" = phase shift. "AR" = amplitude ratio. - 111-9 .5e2 $\widetilde{\rho} = \rho' / \overline{\rho}.$ \widetilde{u}_{xtrack} = perturbation of x-track wind. Use red-noise model and Wavelet analysis (Torrence & Compo, 1998) to determine the **power, location and uncertainty** of each traveling atmospheric disturbance (TAD) event. **Power spectrum** \implies **rectified amplitude spectrum** (Chen et al., 2016) UTC 2010-07-05 22:10:20~23:39:50 (a) 4($\overline{\rho}$ 20 % ρ'ĺρ -20 Amplitude (%) (c) $\alpha = 0.804$ (b) $_{330}^{100}$ 2100 4096 λ_t 8192 3×10 4×10[°] 2×10 $\times 10$ Distance along satellite track (km)

In-situ observation of thermospheric gravity waves by GOCE

