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Global Observation of Gravity Waves using HIRDLS Temperature Measurements

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Previous studies have demonstrated the importance of the effect of gravity wave dissipation on global transport and heat fluxes. However, this effect has not been realistically represented in gravity wave parameterizations employed in most numerical models due to a lack of observations of the global distribution of gravity wave sources, propagation, growth and breakdown. Therefore, developing a global climatology of gravity waves has great potential for example for weather and climate and atmospheric chemistry applications. Satellite observation of gravity waves is in an advantageous position because of its consistent global coverage. Compared with previous instruments, HIRDLS (HIgh Resolution Dynamics Limb Sounder) has the highest vertical resolution ($\sim$1 km). This makes it suitable for globally observing vertically propagating gravity waves. A gravity wave extraction algorithm has been developed at the University of Leicester to extract and isolate gravity waves using HIRDLS temperature measurements. In the algorithm, the gravity wave temperature perturbations are calculated by removing the background field which includes stationary and slowly moving planetary waves. We then dynamically filter thermal tides, fast-moving planetary waves, equatorial Kelvin waves, and possible system effects from HIRDLS instrument and other effects from background atmosphere. Gravity wave temperature variances that represent the squared wave amplitudes are computed from the gravity wave temperature perturbations and investigated for seasonal gravity wave features. In this presentation, the development of the algorithm for extracting gravity waves will be

explained and examples of the global gravity wave patterns in HIRDLS temperatures will be shown and discussed.