Geophysical Research Abstracts
Vol. 14, EGU2012-9146, 2012
EGU General Assembly 2012

Global scale stratospheric processes as measured by the infrasound IMS network

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IMS infrasound array data are routinely processed at the International Data Center (IDC). The wave parameters of the detected signals are estimated with the Progressive Multi-Channel Correlation method (PMCC). This new implementation of the PMCC algorithm allows the full frequency range of interest (0.01-5 Hz) to be processed efficiently in a single computational run. We have processed continuous recordings from 41 certified IMS stations from 2005 to 2010. We show that microbaroms are the dominant source of signals and are near-continuously globally detected. The observed azimuthal seasonal trend correlates well with the variation of the effective sound speed ratio which is a proxy for the combined effects of refraction due to sound speed gradients and advection due to along-path wind on infrasound propagation. A general trend in signal backazimuth is observed between winter and summer, driven by the seasonal reversal of the stratospheric winds. Combined with propagation modeling, we show that such an analysis enables a characterization of the wind and temperature structure above the stratosphere and may provide detailed information on upper atmospheric processes (e.g., large-scale planetary waves, stratospheric warming effects). We correlate perturbations and deviations from the seasonal trend to short time-scale variability of the atmosphere. We discuss the potential benefit of long-term infrasound monitoring to infer stratospheric processes for the first time on a global scale.