

Systematic errors of the site position estimations by GPS caused by the atmospheric Mountain lee waves in Japan (II)

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The Global Positioning System (GPS) meteorological analysis detected atmospheric mountain lee waves excited by a strong westerly wind ahead of an approaching cold front. On the east coast of the Izu Peninsula, Central Japan, a dense permanent GPS network has been installed with sites separated by three to ten km. Before the approach of the cold front on 7th March 1997, significant atmospheric gradients caused by the inhomogeneous water vapor are detected at the sites along the east coast of the Izu Peninsula because of a wet and cold atmosphere to the west of these sites. In contrast, the island site 6 km east of the east coast detects a strong gradient with the opposite sense. The Geostationary Meteorological Satellite (GMS) cloud images of the region show rows of the clouds due to mountain lee waves consistent with the GPS measurements. A numerical simulation explains the wavelength and amplitude of the mountain lee waves although the phase is shifted, probably because of the lack of the precise observations of the atmospheric conditions. The atmospheric gradients induce large systematic errors in the site horizontal estimates from the routine processing. This study demonstrates that large errors in position estimates can result from atmospheric phenomena like mountain waves in regions with mountainous topography like the Japanese Islands.