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Use of GPS high rate kinematic measurements for local sea surface determination, Vanuatu Archipelago.

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The Vanuatu archipelago, South West Pacific is part of the « ring of fire », where plates are quickly converging. Due to the intense tectonic activity, bathymetry is complex and local Mean Sea Surface (MSS) deviations are huge (slope up to 0.2m/km).These small scale geoid undulations are not adequately represented in the global MSS builded from altimetry data sets (e. g. CLS01). Several sea surface surveys (2004, 2006, and 2007) were conducted all around Santo Island and across the Vanuatu subduction zone using onboard GPS (R/V Alis) and an on purpose designed GPS buoy. These high rate data were processed in kinematic mode using a scientific GPS software(GAMIT, from the MIT). Methodologic developments were carried out to improve the GPS accuracy. Scattering of the GPS instantaneous measurements was reduced using Motion Reference Unit height variation recording. The R/V antenna height was accurately estimated from several calibration sessions all along the experiment. Special attention was brought to the « squat » effect which impacts the antenna height when the R/V moves at high speed. Tide gauge data from Sabine and Wusi Banks (offshore sites) as well as ocean tide models (FES2004) provide us tide corrections. Instantaneous sea surface height map was thus obtained with a few centimetre precision.

We present here the experiment methodology and the steps we implemented to achieve the final precision. We also discuss some local MSS variations we detect, which can

be directly related to local bathymetry and tectonic features.