***Student research proposal*:**

Impact of static sea surface topography variations on ocean surface waves

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Classical oceanographic studies on ocean waves over non-uniform topography, assume that over the small topographic scale, the acceleration of gravity is a spatially constant vector, **g**=const. Newton's laws of motion, however, tells us that a non-uniform topography locally leads to a non-uniform gravitational acceleration, so that **g**= **g**(**x**) now is a *field*. Over an isolated subsurface mountain, for example, within the water column the gravitational acceleration thus has a component pointing towards the excess mass contained in the mountain (when comparing the density of the ocean crust, below the mountain, to that of water in case there was no mountain at all). The water thus displaced, mimics the mountain shape at the free surface, to the extent that the resulting horizontal pressure gradient balances the horizontal component of the inclined gravity field. A new, static equilibrium is thus attained, that can be monitored by means of satellite altimetry: the shape of the ocean bottom is 'imaged' by the static shape of the ocean surface.

The question we want to address in this student project is whether or not the spatial nonuniformity of the gravity field leads to additional effects on ocean surface waves (apart from the trapping and reflection/transmission aspects encountered over nonuniform topography in the classical approach).

Two methods will be employed to address this question:

1) Theoretical, 2D study of wave scattering over isolated topography in classical (constant **g**) versus nonclassical (nonconstant **g**)**.**
2) Empirical, by analysis of altimeter data over an ocean mountain or trench. For this we use a raw altimeter data set, and time average to obtain the static sea surface topography. Then we subtract this sea surface topography and analyse the spatial structure of the resulting ("noise") field for high frequency (diurnal, tidal, supertidal frequencies).