# Science of Sea Level Changes

**Relation between mass changes in the water cycle and LSL:**

Sea level equation (Farrell&Clark, 1976)

$$\xi(\vartheta,\lambda,t) = c(t) + O(\vartheta,\lambda,t)\int_{-\infty}^{t}\int_{0}^{\pi}\int_{0}^{2\pi} G(\vartheta,\lambda,\vartheta',\lambda',t-t') \frac{\mathrm{d}}{\mathrm{d}t'}\{O(\vartheta',\lambda',t')\rho_{\mathrm{W}}\xi(\vartheta',\lambda',t') + [1 - O(\vartheta',\lambda',t')]\,\rho_{\mathrm{L}}\eta(\vartheta',\lambda',t')\}\sin\vartheta'\mathrm{d}\lambda'\mathrm{d}\vartheta'\mathrm{d}t'.$$

$\xi$: local sea level change (distance to the deformable solid Earth surface),
$G$: Green's function for sea level,
$O$: ocean function,
$\eta$: cumulated water/ice load change due to mass added or removed from land,
$\rho_{\mathrm{W}}$ and $\rho_{\mathrm{L}}$: densities of the ocean water and the load (water or ice), respectively,
$c(t)$: quantity to ensure mass conservation.

LSL change

Load on ocean areas

Loads on land areas