



## **20th century global sea level rise: Its determination and cryospheric contributions**

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Sea level rise has been widely recognized as a measurable signal as one of the consequences of possible anthropogenic effect of global climate change. The small rate of sea level rise signal, at 1-2 mm/yr during the last century, at present (2001 IPCC TAR) could only be partially explained by a number of competing geophysical processes, each of which is a complex process within the Earth atmosphere-ocean-cryosphere-hydrosphere system. These signals include the mass balance of the ice sheets, ice shelves, and glaciers; retention of water in reservoirs, terrestrial hydrological balance, thermosteric and halosteric effects and the atmospheric barotropic response of the ocean. Of these the cryosphere budget represents one of the largest unknown and dominates the total sea level signal. At present, these signals are unable to fully account for from comparing observations of 1.8 mm/yr sea level rise and the contributing geophysical causes. Significant geographical variations in both the thermosteric and the self-gravitational sea level signals as result of the present-day ice melt, and glacial isostatic adjustment effect since the last Ice Age and beyond. This paper provides an estimate of the global sea level rise during the 20th century quantifying the respective contributions from Antarctica and Greenland ice sheet melt, glacier melt, thermal expansion of the sea level, using tide gauges and multiple mission satellite altimetry, with a particular focus on the contribution from the cryosphere.