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The 2004 Indonesian earthquake and tsunami: surface effects from SAR data

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The Indonesian earthquake took place on December 26, 2004, at 00:58 GMT a Mw 9.0 in the Indian Ocean, offshore the W coast of Sumatra, at a depth of about 30 km. This earthquake is one of the largest events of the last 100 years, comparable only to the Chile 1960 and Alaska 1964 ones. The earthquake originated in the subduction zone of the Indian and Burma plates, moving at a relative velocity of 6 cm/year. The aftershocks were distributed along a plate boundary about 1000 Km long, between Sumatra and the Andaman islands. GPS vectors point out a strong surface displacements towards SW of Sumatra Island ranging one meter and more. Ground surveys in Sumatra and Andaman Islands showed wide uplift areas and large modification of the coastline. A destructive tsunami followed and hit, up to some hours after the earthquake, the coastlines of the surrounding regions, causing widespread destruction in Indonesia, India, Thailand, and Sri Lanka. The European Space Agency made available a data package composed by ERS SAR and Envisat ASAR data. Therefore we used these data to estimate the co-seismic and tsunami effects occurred on the human settlements and on the coast. SAR images were co-registered each other and changes were analysed both visually and automatically. Image difference and correlation coefficient between data before and after the destructive event were exploited. Changes along the coastline hit by the tsunami have been detected and are reported in this work.