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Extreme events assessment methodology coupling rainfall and tidal levels in the coastal floodplain of the São Paulo North Coast (Brazil) for drainage purposes

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The Caraguatatuba Coastal Plain is the wider in São Paulo State (Brazil) North Coastline. The Santo Antônio Torrent Catchmenth drains that region with high urban concentration (around 100,000 permanent inhabitants), which may quintuplicate with the turists in the summer period. In the last decade important oil and gas sea reserves were discovered and the facilities for their treatment were located in that region. For that great economic growth scenario it is mandatory to design mitigation risk measures to have the fluvial forcing processes well known, considering the natural hazards. The Santo Antônio catchment has a surface area of 40 km2, heavy rainfall rates (around 3000 mm/year), concentrated mainly in the summer period, producing high fluvial sediment transport capacity, floods and debris-flows. Due to the steep slopes and the altitude ($\sim$ 1000 m) of the mountains near the coast, the hydrological orographic effect rapidly condensates the sea humidity and recurrent and intense flood events cause extensive risks and damages to population and infrastructures. Strong debris-flows occur in that region, because rains higher than 300-400 mm per day occur in multi decadal periods. Due to the wind blowing landward the humidity from the sea, also meteorological tides occur in correspondence of high rainfall rates. The aim of this project is to present an extreme hydrological assessment methodology, coupling rainfall rates and tidal levels, to show the impact of climate changes during the last decades. It is also presented the magnitude of the rising meteorological tide coupled with the extreme rainfall events. The data base analysed comprised long term data of rainfall and tidal measurements from 1954 to 2003. The correlations of the two data were divided in five classes of rainfall in mm per day (> 0, > 25, > 50, > 75 and > 100) and estimated the tidal levels for different return periods in years (2, 5, 10, 20, 50, 75 and 100). The comparison of two distint periods (1954 to 1980 and 1981 to 2000) for extreme events typically used for drainage projects (rains higher than 50 mm/day) clearly showed an increasing in tidal levels for the same return period. That trend indicates the importance to mantain a monitoring network in order to avoid the interruption of long term data series. According to that conclusions were evaluated the number of constructions and inhabitants affected in the are prone of that flooding in the next decades.