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Impact of climate change on sea level rise and on groundwater availability

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A new formula for determining increasing sea intrusion in coastal fractured rock aquifers as a consequence of local sea level rise (LSLR) was presented. The formula was applied to the Salento peninsula (Southern Italy), which is an important source of drinking water for locals and, it can be applied to any coastal groundwater at a regional scale in order to evaluate the impact of climate change on local water resources. Moreover the interpolation of tide-gauge measurements was performed at three monitoring stations from 2000 to 2014. The best fit of measurements provides a rate of LSLR ranging from 4.4 to 8.8 mm/y. This local calculated rate matches the recent 21st and 22nd century projections of mean global sea level rise. It includes the melting of Greenland and Antarctica's ice sheets, the effect of seawater thermal expansion, glaciers and ice caps melting and changes in land water storage quantity. Thus, the Ghyben-Herzberg's equation of freshwater/saltwater interface position was rewritten in order to determine the decrease in groundwater discharge due to the maximum LSLR during the 21st and 22nd centuries. Results regarding the progress of seawater intrusion due to LSLR suggest an impressive depletion of available groundwater volume, which locally may achieve 15% of current pumping for drinking purposes from Salento's groundwater. This reduction does not take into account groundwater impairment due to overexploitations. This study strongly suggests the need for a prompt actuation of measures in order to limit groundwater depletion in the near future.