

Tide Contribution in the Flood Event of Jeddah City: Mathematical Modelling and Different Field Measurements of the Groundwater Rise

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Abstract : This paper is aimed to bring new elements that demonstrate the tide caused the groundwater to rise in the shoreline band, on which the urban areas occurs, especially in the western coastal cities of the Kingdom of Saudi Arabia like Jeddah. The reason for the last events of Jeddah inundation was the groundwater rise in the city coupled at the same time to a strong precipitation event. This paper will illustrate the tide participation in increasing the groundwater level significantly. It shows that the reason for internal groundwater recharge within the urban area is not only the excess of the water supply coming from surrounding areas, due to the human activity, with lack of sufficient and efficient sewage system, but also due to tide effect. The research study follows a quantitative method to assess groundwater level rise risks through many in-situ measurements and mathematical modelling. The proposed approach highlights groundwater level, in the urban areas of the city on the shoreline band, reaching the high tide level without considering any input from precipitation. Despite the small tide in the Red Sea compared to other oceanic coasts, the groundwater level is considerably enhanced by the tide from the seaside and by the freshwater table from the landside of the city. In these conditions, the groundwater level becomes high in the city and prevents the soil to evacuate quickly enough the surface flow caused by the storm event, as it was observed in the last historical flood catastrophe of Jeddah in 2009.

Keywords : flood, groundwater rise, Jeddah, tide

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