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Title: Diurnal tidal influence over self-potential measurements: A Noise or signal for coastal salinity dynamics?

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ABSTRACT

Seawater intrusion (SWI) is a significant environmental concern for coastal habitats and groundwater sustainability. Among major natural factors, tidal influence significantly exacerbates seawater intrusion in coastal areas. Tides cause fluctuations in sea level, leading to periodic changes in the pressure on coastal aquifers, as during high tide, an elevated hydraulic head can drive seawater further into freshwater aquifers. The present study primarily aims to map the fresh-saline water intermixing zone under the influence of tidal currents using self-potential (SP) measurement along the Contai-Mandarmani region (East Coast, India). The SP method was chosen as a non-invasive tool because tidal pumping effects can influence the pressure in aquifers and alter the distribution of electrical potential in the subsurface. Two non-polarizable electrodes (porous pots) were used for the survey to minimise the contact potential. The data was measured for a tidal cycle of twelve (12 hr.) duration. From the voltage reading, it was observed that during the transition, the SP response varied from -63 to -103 mV (during low tide) and -103 to -25 mV (during high tide). The SP data (mV) was plotted against tidal height (m) for correlation, and both curves followed a similar trend. The study establishes that a self-potential survey conducted near the seashore will have a greater magnitude from tidal currents than the potential generated from the mobility of ions from salt to the freshwater zone (background voltage).