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Long Electrode ERT: modeling and field experiment

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The upward surge of saltwater due to a high extraction rate of water plants, tectonic weakness zones or eroded clay layers threatens the fresh water supply in some regions of northern Europe. For monitoring the movement of salt water the usage of borehole measurements is insufficient as only point information can be retrieved. Our aim is to develop a monitoring system that uses boreholes as electrodes (Long Electrode ERT - LEERT) in conjunction with surface-electrodes. As a first step we conducted synthetic analysis using Finite Element Method and the Complete Electrode Model in order to obtain a better insight on the influence of long electrodes ERT measurements. At this stage we investigated sensitivity distributions, the effect of changing contact impedances and simple resistivity distributions on a four point array and multi electrode settings. These analyses showed that surface electrodes have to be incorporated while conduction long electrode ERT measurements to enhance the vertical resolution. The synthetic study showed that an effect of changing contact impedances only takes place for large differences of about three to four orders.