# Upscaling of Anisotropic Hydraulic Conductivity to Determine the Extent of Saltwater Intrusion

**Priyanka, B.N.**[1] and Mohan Kumar, M.S.[1,2]
[1]Department of Civil Engineering, Indian Institute of Science, Bengaluru, KA, India
[2]Assosicate faculty, ICWaR and Indo-French Cell for Water Sciences, Indian Institute of Science, Bengaluru, KA, India

**ABSTRACT**
One of the most important aquifer parameter to be considered while modeling saltwater intrusion (SWI) is hydraulic conductivity. This parameter can be assessed at a discrete point or at a local scale by conducting field experiments, but it is not feasible to conduct experiments at an aquifer scale. In the present investigation, an intrinsic upscaling technique is used to estimate hydraulic conductivity in a coastal aquifer which is located on the west coast of Karnataka, India. The first step in this upscaling procedure is to establish a linear relationship between hydraulic conductivity and aquifer resistivity. The relationship (i.e. $K=595.52\sigma+0.9299$) is established with coefficient of determination of 0.931, from vertical electrical sounding survey and pumping test results. The linear regression equation is used to determine the local hydraulic conductivity at electrical resistivity profiles in x and y directions. The resistivity profiles are selected such that they are located approximately 500 m from the coastal line and do not have influence of salt concentration. The next step is to upscale the local scale hydraulic conductivity values in x direction (Kx) to aquifer scale by single realization conditioned random gaussian field generator with mean, variance and correlation length. While hydraulic conductivity values in y direction (Ky) are not considered for this upscaling technique because the correlation length was greater than 1100 m. This correlation length is approximately equal to the $1/4^{th}$ of the length of the aquifer, thus Ky can be assumed to be homogeneous. The upscaled anisotropic hydraulic conductivity values are used as an input to the finite element numerical model (FEFLOW) for the transient simulation of SWI into a coastal aquifer. This study presents the state of knowledge about the extent of saltwater intrusion (SWI) with upscaled anisotropic hydraulic conductivity.