



## Evaluating the potential of Sentinel-1 images for the estimation of soil moisture on an alluvial Fan

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We evaluate the potential of Sentinel-1A & 1B satellite images to estimate the volumetric soil moisture content over an alluvial fan of the Kosi River in the North Bihar, India. Over this region, only dual polarised images (VH and VV) are available. However, the existing backscattering models (i.e., Dubois, Oh and IEM models) uses quad polarised (VV, VH, HH and HV) images for the estimation of soil permittivity and surface roughness over the bareland. To overcome the constraint of dual polarised data, we eliminated one of the unknown (i.e. surface roughness) by developing a regression model between the in-situ measured surface roughness and the ratio of backscatter values (VH/VV) in dB. In a field campaign in the Kosi Fan from December 10-21, 2019, we have measured surface roughness, soil temperature, soil pH and soil moisture at 78 different location using the pin-meter, soil survey instrument (soil temperature and pH), and Time Domain Reflectometer (TDR) respectively. The average surface roughness and soil moisture varies between (0.61 - 5.45) cm and (0.12-0.53) m<sup>3</sup>/m<sup>3</sup> respectively in the study area.

Further, using the surface roughness we modify the Dubois, Oh and IEM models. This reduces the number of unknowns in the models from two to one; the soil permittivity. We compute the soil permittivity from the inversion of the existing backscattering models. Finally, we use the permittivity values in the Top's model to estimate the volumetric soil moisture in the study area. Our initial results exhibit a good correlation ( $R^2 = 0.85$ ) to the in-situ measured soil moisture.