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Satellite altimeter to estimate discharge of the Ganga River

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We use satellite altimeter data to estimate average monthly discharge at seven different locations in the middle and lower parts of the Ganga River. We have obtained the water level from different satellite altimeter mission ERS-2 (1995 - 2007), Envisat (2002 - 2010), and Jason-2 (2008 - 2017) through publicly available databases Hydroweb and DAHITI. To make the water level comparable with the gauge stations, we applied the datum and offset correction to the altimetry datasets. The corrected water level data well accord with the ground measurements with RMSE values in a range between (22 - 71) cm.

We then established stage-discharge rating curves from the water-level derived from satellite altimeter and the corresponding discharge measured at the nearest gauge station. We use these rating curves to estimate discharge of the Ganga River in the middle (Kachla bridge, Kanpur, Shahzadpur, Prayagraj and Mirzapur) and lower (Azmabad and Farakka) reaches from the water-level from satellite altimeter. Our estimates of discharge compare with the monthly average discharge recorded at the nearest ground station.

We observed that the uncertainty in the discharge estimate is relatively high in the middle than the lower reaches of the Ganga River. This is probably associated with the low discharge and shallow flow depth of the Ganga River in the middle reaches as compare to the high flow depth and discharge in the lower reaches. Overall performance analysis of statistical parameters (NSE, RSR, PBIAS, and R^2), suggests that except for the Kanpur station, our estimates of discharge can be categories into "good" to "satisfactory".