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Remote Sensing of Large River Basins

Soner Uereyen¹, Felix Bachofer¹, Juliane Huth¹, Igor Klein¹, and Claudia Kuenzer^{1,2}

¹German Aerospace Center (DLR), German Remote Sensing Data Center (DFD), Oberpfaffenhofen, Germany

²University Wuerzburg, Institute of Geography and Geology, Wuerzburg, Germany

Irrespective of administrative boundaries, river basins are natural spatial units covering the entire land area. They provide many resources, including freshwater, which is essential for the environment and human society, as well as irrigation water and hydropower. At the same time, river basins are highly pressured i.e. by human induced environmental changes, such as deforestation, urban expansion, dam construction, as well as climate change induced sea level rise at estuarine regions and extreme events such as droughts and flooding. Therefore, monitoring of river basins is of high importance to understand their current and future state, in particular for researchers, stake holders and decision makers. However, land surface and surface water variables of many large river basins remain mostly unmonitored at basin scale. Currently, only a few inventories characterizing large scale river basins exist. Here, spatially and temporally consistent databases describing the evolution and status of large river basins are lacking. In this context, Earth observation (EO) is a potential source of spatial information providing large scale data at global scale. In this study, we provide a comprehensive overview of research articles focusing on EO-based characterization of large river basins and corresponding land surface and surface water parameters, we summarize the spatial distribution and spatial scale of investigated study areas, we analyze used sensor types and their temporal resolution, and we identify how EO can further contribute to characterization of large river basins. The results reveal that most of the reviewed research articles focus on mapping of vegetation, surface water, as well as land cover and land use properties. In addition, we found that research articles related to EO applications hardly investigate study areas at the spatial scale of large river basins. Overall, the findings of our review contribute to a better understanding of the potentials and limitations of EO-based analyses of large river basins.