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A spatial hydrological model for estimation of unaccounted water diversions in the northern Murray-Darling Basin of Australia

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Abstract Hydrological knowledge of irrigated farms within the inundation plains of the Murray-Darling Basin (MDB) is very limited in both quality and reliability of the observation network. This paper focuses on Land Surface Diversions (LSD) that encompass all forms of surface water diversion, except the direct extraction of water from rivers, watercourses and lakes by farmers for the purposes of irrigation, stock and domestic supply. Its accurate measurement is very challenging, due to the practical difficulties associated with separating the different components of LSD and estimating them accurately for a large catchment. A hydrological water balance model coupled with a remote sensing (RS) technique was developed to estimate unaccounted LSD for selected catchments of the northern areas of the basin. For accurate accounting of diversions and reduction of errors due to the inclusion of non-cropped portions of the catchments, a detailed methodology was implemented, which includes the estimations of actual evapotranspiration (ET_a) and other water balance components of the irrigated areas. Results showed that LSD varied between different catchments and increased with the size of irrigated cropped area. The developed methodology has a great potential to estimate unaccounted diversions in other basins across the globe.

Key words unaccounted water; Land Surface Diversions; RS; SAM-ET; MODIS; Australia