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Assessment of land use and land cover datasets for Brazil and impact on C emissions

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Brazil is responsible for about one third of the global land use and land cover change (LULCC) carbon dioxide emissions. However, there is a disagreement among different methodologies on the magnitude and trends in emissions and their geographic distribution. One of the main uncertainties is associated with different LULCC datasets used as input in the different approaches. In this work we perform an evaluation of LULCC datasets for Brazil, including the global dataset (HYDE 3.2) used in the annual Global Carbon Budget (GCB), and national Brazilian dataset (MapBiomass) over the period 2000-2018. We also analyze the latest global HYDE 3.3 dataset based on new FAO inventory estimates and multi-annual ESA CCI satellite-based land cover maps. Results show that the new HYDE 3.3 can represent well the observed spatial variation in cropland and pastures areas over the last decades compared to national data (MapBiomass) and shows an improvement compared to HYDE 3.2 used in GCB. However, the magnitude of LULCC assessed with HYDE 3.3 is lower than national estimates from MapBiomass. Finally, we used HYDE 3.3 as input to two different approaches included in GCB, a global bookkeeping model (BLUE) and a process-based Dynamic Global Vegetation Model (JULES-ES) to determine the impact of the new version of HYDE dataset on Brazil's land-use emissions trends over the period 2000-2017. Both JULES-ES and BLUE now simulate a negative land-use emissions trend for the last two decades. This negative trend is in agreement with Brazilian INPE-EM, global H&N bookkeeping models, FAO

and as reported in National GHG inventories (NGHGI), although magnitudes differ among approaches. Overall, the inclusion of the multi-annual ESA CCI Land Cover dataset to allocate spatially the FAO statistical data has improved spatial representation of agricultural area change in Brazil in the last two decades, contributing to improve global model capability to simulate Brazil's LULCC emissions in agreement with national trends estimates and spatial distribution.