Present and future carbon-sequestration potential of tropical rainforests

Jean-François Exbrayat (1,2), David T. Milodowski (2), T. Luke Smallman (1,2), Mathew Williams (1,2)
(1) National Centre for Earth Observation, University of Edinburgh, Edinburgh EH9 3FF, United Kingdom, (2) School of GeoSciences, University of Edinburgh, Edinburgh EH9 3FF, United Kingdom

Multiple international initiatives have been introduced to mitigate climate change by reforesting previously cleared areas and restoring degraded forests (e.g. UN-REDD). However, the capacity of forests to grow and store carbon under projected climate change remains uncertain. Here we use a machine-learning approach to determine the present and future potential biomass and carbon-sequestration potential of tropical rainforests. Our results indicate a current carbon-sequestration potential of 69.0 Pg C. We estimate that 64% of the carbon-sequestration potential corresponds to reforestation in regions that have been previously cleared, and 36% correspond to the restoration of degraded forests. Our results indicate that reforestation potential decreases to 33.0 Pg C and 24.1 Pg C when using climate change projections under RCP4.5 and RCP8.5 respectively. This decrease is due to reduced carbon-sequestration potential from previously disturbed regions and a risk of tropical rainforests die-back due to projected warmer and drier conditions.