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Atmospheric Rivers in a Changing Climate: An Overview from the second phase of the Atmospheric River Tracking Method Intercomparison Project (ARTMIP)

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The Atmospheric River Tracking Method Intercomparison Project (ARTMIP) is an international collaborative effort to understand and quantify the uncertainties in atmospheric river (AR) science based on the use of different methods for identifying and tracking ARs. Many AR detection techniques are currently employed for a number of purposes, and the literature reports a wide range of conclusions based on these techniques. ARTMIP strives to provide the community with information on different methodologies and provide guidance on the most appropriate algorithm for a given science question or region of interest. The goals of the recently completed first phase of ARTMIP, Tier 1, were to quantify differences in AR metrics, such as frequency and seasonality, intensity, duration, and precipitation attributable to ARs through the application of all algorithms to MERRA-2 reanalysis. The second phase of the project, Tier 2, will focus on addressing specific science questions, such as sensitivity to reanalysis product and climate change topics, that may benefit from the application of an ensemble approach. ARTMIP is poised to help researchers make sense of the diverse and sometime opposing nature of metrics that currently exist in the literature, and connect those metrics (and algorithms) to physical mechanisms, and, ultimately climate controls.

Here we present results from the first Tier 2 project, the application of AR detection algorithms to high resolution (0.25°, 3-hr data) climate change simulations available through the International CLIVAR C20C+ Detection and Attribution Project. Changes in bulk AR characteristics from 15 different algorithms (spanning both regional and global domains) are compared between two climates: (1) the historical period (1979 - 2005) and (2) end-of-the-century RCP 8.5 (2079 - 2099). This study will focus on the impact of climate change on characteristics such as frequency of occurrence, their spatial scale and duration along various coastlines, as well as, the impact of the algorithms themselves on various metrics.