Session: C34 Poster: W181A

C20C - Climate of the 20th Century: Attribution of Atlantic multidecadal variability to external forcing, internal variability and weather noise

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Several approaches are applied to attribute the Atlantic Multidecadal Variability (AMV), as simulated in a specific 20th century CCSM3 CGCM run (denoted 20C1), to external forcing or internal variability. The externally forced AMV is estimated from the AR4 ensemble of CCSM3 1870-2000 simulations. Removing this externally forced signal from the 20C1 AMV provides an estimate of the internally generated AMV in 20C1. The atmospheric weather noise in 20C1 is estimated by subtracting the atmospheric response to the 20C1 SST and external forcing from the full 20C1 fields. The response to the 20C1 SST and external forcing is found as the ensemble mean of an ensemble of CAM3 AGCMs forced by the 20C1 SST and external forcing. Simulations with an interactive ensemble version of CCSM3, IE-CCSM3 (a CAM3 ensemble coupled to other CCSM3 component models through the flux coupler), are used to isolate the AMV forced by the 20C1 atmospheric weather noise from that attributable to other sources. The above set of simulations is also used to attribute variability in the Atlantic Meridional Overturning Circulation and Sahel precipitation to external or internal causes, to isolate the role of atmospheric weather noise, and to relate this variability to the AMV.