



Effects of Wind and Freshwater on the Atlantic Meridional Overturning Circulation: Role of Sea Ice and Vertical Diffusion

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Effects of wind and fresh water on the Atlantic meridional overturning circulation (AMOC) are investigated in a fully coupled climate model (CESM1.0). The AMOC can change significantly when perturbing either the wind stress or fresh water flux in the northern North Atlantic. This work pays special attention on the wind stress effect. Our model results show that the wind forcing is a crucial element in maintaining the AMOC. When the wind-stress is reduced, the vertical convection and diffusion are weakened immediately, triggering a salt deficit in the northern North Atlantic that prevents the deep water formation there. The salinity advection from the south, however, plays a contrary role to salt the upper ocean. As the AMOC weakens, the sea ice expands southward and melts, freshening the upper ocean that weakens the AMOC further. There is a positive feedback between the sea ice melting and AMOC strength, which eventually determines the AMOC strength in the reduced wind world.