

---

# Aerosol-forced AMOC changes in CMIP6 historical simulations.

Matthew Menary<sup>\*1</sup>, Jon Robson<sup>2</sup>, Richard Allan<sup>3</sup>, Ben Booth<sup>4</sup>, Christophe Cassou<sup>5</sup>,  
Guillaume Gastineau<sup>1</sup>, Jonathan Gregory<sup>3,4</sup>, Dan Hodson<sup>2</sup>, Colin Jones<sup>6</sup>, Juliette  
Mignot<sup>7</sup>, Mark Ringer<sup>4</sup>, Rowan Sutton<sup>2</sup>, Laura Wilcox<sup>2</sup>, and Rong Zhang<sup>8</sup>

<sup>1</sup>Laboratoire d'océanographie et du Climat : Expérimentations et Approches Numériques – Sorbonne  
Université : UMR71, Institut National des Sciences de l'Univers, Centre National de la Recherche  
Scientifique : UMR7159, Muséum National d'Histoire Naturelle : USM402, Institut de Recherche pour  
le Développement, École normale supérieure - Paris, Université Paris sciences et lettres, Université de  
Versailles Saint-Quentin-en-Yvelines, Commissariat à l'énergie atomique et aux énergies alternatives,  
Ecole Polytechnique, Centre National d'études Spatiales [Toulouse], Sorbonne Université, Centre  
National de la Recherche Scientifique : FR636, *Université de Paris* :

*FR636, Centre National d'études Spatiales [Toulouse], Centre National d'études Spatiales [Toulouse] – case 100 – 4 place Jussieu*

<sup>2</sup>National Centre for Atmospheric Science (Reading) – Department of Meteorology, University of  
Reading, PO Box 243, Earley Gate, Reading RG6 6BB., United Kingdom

<sup>3</sup>University of Reading – Whiteknights, PO Box 217, READING, Berkshire, RG6 6AH., United  
Kingdom

<sup>4</sup>Met Office Hadley Centre – Exeter, United Kingdom

<sup>5</sup>CNRS-Cerfacs – CNRS : UMR5318 – 42, Av. G. Coriolis, 31057 Toulouse, France

<sup>6</sup>National Centre for Atmospheric Science – School of the Earth and Environment University of Leeds  
Leeds, United Kingdom

<sup>7</sup>Laboratoire d'océanographie et du Climat : Expérimentations et Approches Numériques – Muséum  
National d'Histoire Naturelle, Institut national des sciences de l'Univers, Sorbonne Université : UMR71,  
Centre National de la Recherche Scientifique : UMR7159, Institut national des sciences de l'Univers,  
Institut national des sciences de l'Univers, Institut national des sciences de l'Univers, Institut national  
des sciences de l'Univers, Institut national des sciences de l'Univers – case 100 4 place Jussieu 75252  
PARIS CEDEX 05 ou Institut de Recherche pour le Développement Centre de recherche d'Île-de-France 32,  
avenue Henri Varagnat 93143 Bondy Cedex, France

<sup>8</sup>NOAA Geophysical Fluid Dynamics Laboratory – Princeton University, Forrestal Campus, 201  
Forrestal Road, Princeton, NJ 08540-6649, United States

## Abstract

The Atlantic Meridional Overturning Circulation (AMOC) has been, and will continue to be, a key factor in the modulation of climate change both locally and globally. However, there remains considerable uncertainty in recent AMOC evolution. Here, we show that the multi-model mean AMOC strengthened by approximately 10% from 1850-1985 in new simulations from the 6th Coupled Model Inter-comparison Project (CMIP6), a larger change than was seen in CMIP5. Across the models, the strength of the AMOC trend up to 1985 is related to a proxy for the strength of the aerosol forcing. Therefore, the multi-model difference is a result of stronger anthropogenic aerosol forcing on average in CMIP6 than

---

\*Speaker

CMIP5, which is primarily due to more models including aerosol-cloud interactions. However, observational constraints - including a historical sea surface temperature fingerprint and shortwave radiative forcing in recent decades - suggest that anthropogenic forcing and/or the AMOC response may be overestimated.

**Keywords:** amoc, cmip6, aerosols, historical, decadal