



NCAS Science Highlight

Improving our understanding of jet stream dynamics

Ben Harvey¹, John Methven² and Maarten Ambaum²
¹ NCAS-AP, ² University of Reading

What are the new findings?

Our day-to-day weather in the UK is influenced substantially by the position of the North Atlantic jet stream, the narrow, fast-flowing current of air around 10 km above the surface. Weather systems develop along the jet stream and grow in concert with huge north-south meanders of the winds (see figure). Predicting the position and timing of these meanders is a key ingredient of accurate weather forecasts.

In this study we have developed a new theory for understanding the behaviour of jet stream meanders, and in particular examining how their motion is influenced by small-scale details of the structure of the atmosphere at the height of the jet stream.

Why are these findings important?

The new theory allows us to understand the ways in which weather forecast models may misrepresent the movement of jet stream meanders, and therefore produce poor weather forecasts. It builds on recent research highlighting deficiencies in how all current state-of-the-art weather forecast models represent the structure of the atmosphere at the height of the jet stream. In particular, this work quantifies the potential impact of these deficiencies on the forecasts. It points to the need for weather forecast models to have a good representation of the small-scale details which influence the motion of jet stream meanders, and will be used in future to aid model development studies.

How did we discover this?

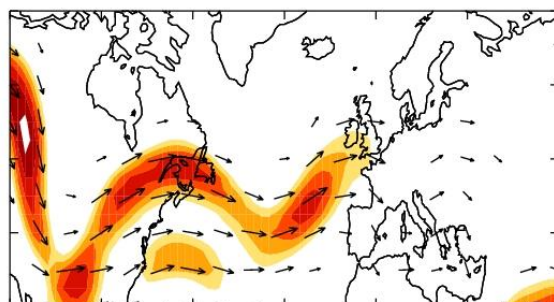
We extended previous mathematical theories of jet stream meanders and performed computer simulations with simplified equations for the atmosphere to verify the results of the theory.

This research was funded by NCAS Atmospheric Physics

NERC SCIENCE OF THE ENVIRONMENT

 University of Reading

Ben Harvey is a researcher in NCAS-Atmospheric Physics at the University of Reading. His research is focused on the dynamics and predictability of the atmosphere.



Above: The position of the jet stream strongly impacts UK weather. The image shows the speed (colours) and direction (arrows) of the jet stream on 5th January 2014, with the end of the jet stream positioned over southern UK. In the following days, a large storm hit the south coast, causing widespread coastal damage and some of the highest ever recorded wave heights.

Find out more:

- See [Ben Harvey's webpage](#)
- Email b.j.harvey@reading.ac.uk
- Take a look at the paper (submitted to Journal of Fluid Mechanics) :

Harvey, Methven and Ambaum

The propagation of Rossby waves of a PV front with finite width

[Return to the NCAS website](#)

Tell us what you think

- How clearly was this article written?
- How interesting or useful was it?
- Do you have any other comments?

Please let us know:

feedback@ncas.ac.uk