



Climate Change and African Easterly Waves

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Why in News?

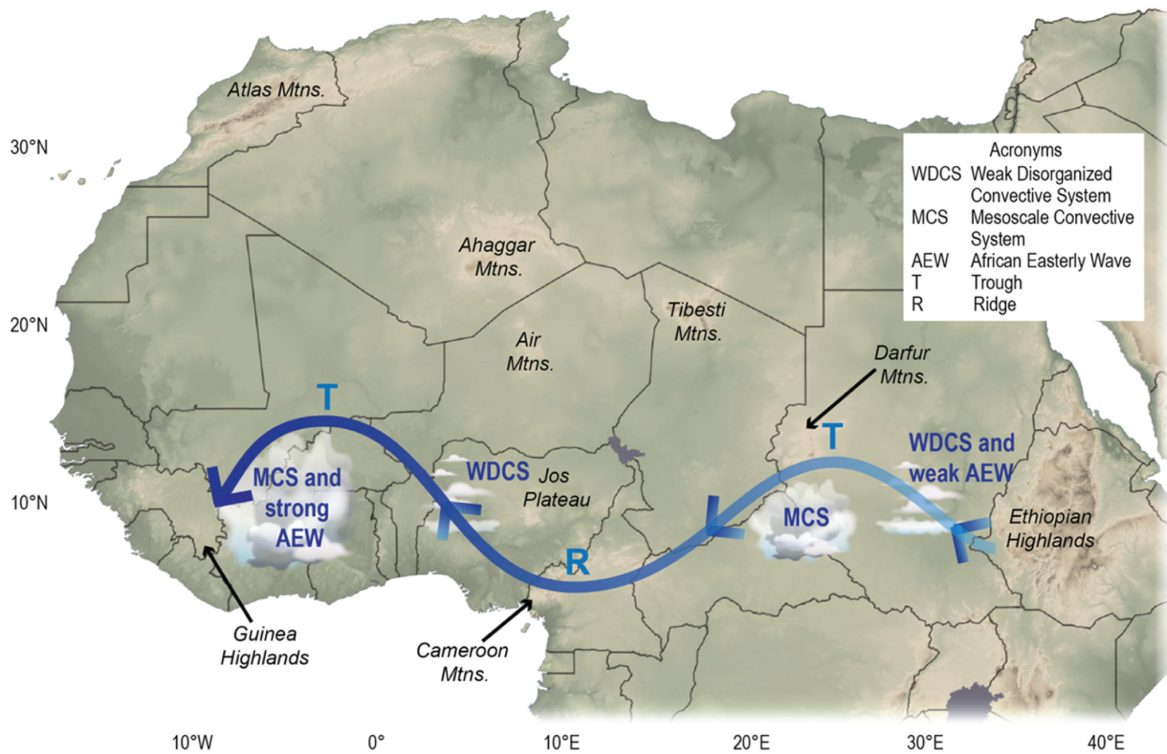
A study published in *Communications Earth & Environment* predicts that [climate change](#) will increase the intensity and frequency of **extreme flooding in the Sahel region**, driven by changes in **African easterly waves (AEWs)**.

What are the Key Highlights of the Study?

- **Increased AEW Activity:** The study predicts an increase in AEWs over the **Sahel-Sahara** by the end of 21st century.
 - The intensification is driven by **increased baroclinicity** (variation in **atmospheric pressure and density** with height) due to a **stronger meridional temperature gradient** (difference in temperature between regions) between the Guinea Coast and the Sahara.
- **Enhanced Monsoon Flow:** The study found that **low-level warming reinforces monsoon flow**, increasing **convergence** (more air entering a vertical column than leaving it) and vertical motion of air along the **intertropical discontinuity (ITD)** altering AEWs formation.
 - The ITD is the boundary between the **hot and dry desert air** and the **cooler and more moist air** from the Arabian Sea.
- **Implications:**
 - **Saharan Dust Transport:** Strong winds from a northern track AEW (close to Sahara Desert) can transport **dry Saharan air, preventing or delaying tropical cyclogenesis** (the formation of tropical cyclones) until more favorable conditions in the warmer western Atlantic.
 - **Connection to MCSs:** AEWs are linked to **Mesoscale convective systems (MCSs)**, which cause extreme rainfall. The study suggests that increased AEW activity may **lead to more frequent and intense flooding events** in the Sahel.

What are African Easterly Waves?

- **Definition:** African easterly waves (AEWs) are weather systems that form over **northern Africa** during the summer and move **east to west toward the Atlantic Ocean**.
- **Significance:** AEWs bring rainstorms to drought-prone areas in northern Africa.
 - Carry **Saharan dust across the Atlantic ocean** and AEWs act as precursors for **Atlantic hurricanes**.
- **Influence:** AEWs significantly affect the **regional hydroclimate**, particularly in the Sahel, making it essential to understand their behavior under global warming.



Sahel Region

- The Sahel is a semiarid region of **western and north-central Africa**, stretching from Senegal in the west to Sudan in the east.
 - It acts as a transition between the **Sahara Desert** to the north and the humid **savannas to the south**.
 - It features **savanna terrain, with low-growing grass, thorny shrubs**, and sparse vegetation.
- The **United Nations (UN)** limits the Sahel to **ten (10) countries** they are Burkina Faso, Cameroon, The Gambia, Guinea, Mali, Mauritania, Niger, Nigeria, Senegal and Chad.
- The **Niger River**, the longest and largest in western Africa, is a major water source for the region.

Boundaries of the Sahel within the context of the United Nations



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