



Atmospheric Rivers

Why in News?

California has experienced an exceptionally wet winter with **11 atmospheric rivers battering the state** since late December 2022.

What are Atmospheric Rivers?

▪ About:

- **Atmospheric rivers** are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics.
 - One well-known atmospheric river called the “Pineapple Express” picks up warm, moist air near Hawaii.
 - When the **Pineapple Express hits land in the Western United States and Canada**, it can cause heavy rain and snow. In California, it can cause up to 5 inches of rain in a day.
- Atmospheric rivers typically occur **in the extratropical North Pacific/Atlantic, southeastern Pacific, and South Atlantic** oceans often making landfall on the west coasts of North and South America. Other regions that experience atmospheric river landfalls include **Greenland, Antarctica, and the south-central United States.**

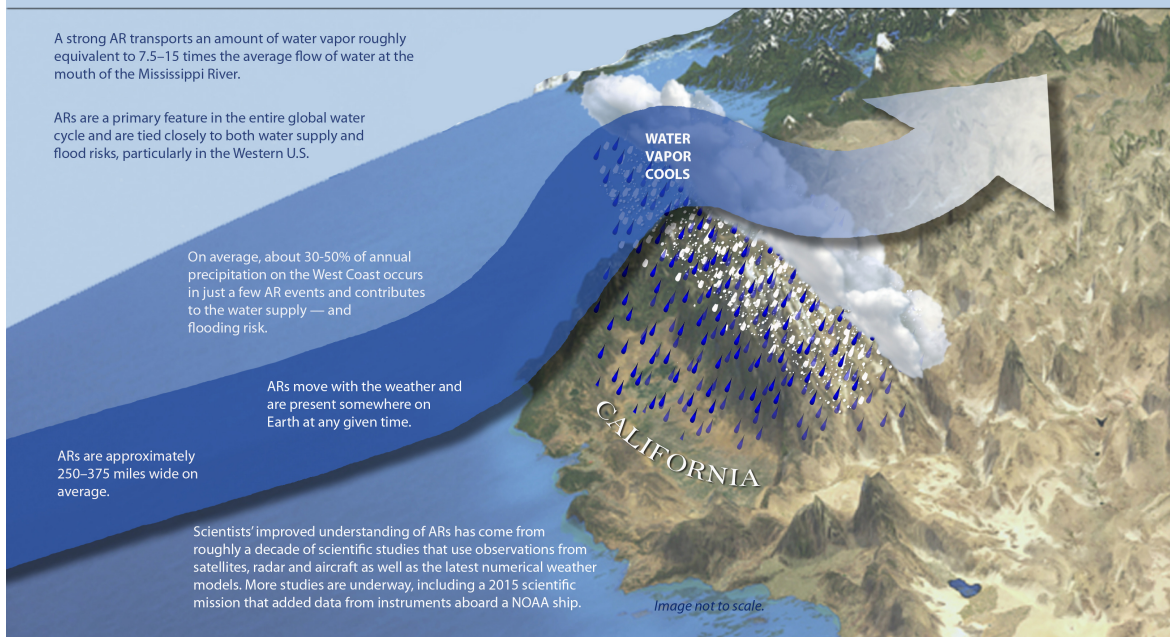
▪ Formation:

- Atmospheric rivers usually begin over tropical regions. Warm temperatures cause **ocean water to evaporate and rise into the atmosphere.** Strong winds help to carry the water vapor through the atmosphere.
- As atmospheric rivers move over land, the **water vapor rises up farther into the atmosphere.** It then **cools into water droplets, which fall as precipitation.**

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The science behind atmospheric rivers

An atmospheric river (AR) is a flowing column of condensed water vapor in the atmosphere responsible for producing significant levels of rain and snow, especially in the Western United States. When ARs move inland and sweep over the mountains, the water vapor rises and cools to create heavy precipitation. Though many ARs are weak systems that simply provide beneficial rain or snow, some of the larger, more powerful ARs can create extreme rainfall and floods capable of disrupting travel, inducing mudslides and causing catastrophic damage to life and property. Visit www.research.noaa.gov to learn more.



▪ Impacts:

- Heavy rainfall associated with ARs can cause **flooding, landslides, and mudslides**.
 - They can also lead to water supply disruption, and develop **drought-like conditions**.

▪ Significance:

- Not all atmospheric rivers cause damage; most are weak systems that often **provide beneficial rain or snow that is crucial to the water supply**.

▪ Climate Change:

- **Climate change is expected to increase the frequency and intensity of ARs** in some regions of the world, particularly in the mid-latitudes.
 - This could have significant implications for water resources management, flood control, and other areas of public policy.

Source: IE

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