



## Indian Monsoon Resembled Australian Monsoon

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### Why in News

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According to a recent **study based on fossil leaves, Indian monsoon 25 million years ago resembled present day Australia's.**

Understanding the past dynamics of Indian monsoon **will help in climate modelling for future monsoon prediction.**

### Key Points

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- **About the Study:**

- The **morphological characters of fossil leaves** from **different geological ages** collected from **Deccan Volcanic Province, East Garo Hills of Meghalaya, Gurha mine in Rajasthan and Makum Coalfield in Assam** were analysed.  
Plant leaf morphological characters such as apex, base and shape are **ecologically tuned with the prevailing climatic conditions** to adapt for all the seasons throughout the year.
- The results indicated that the **fossil leaves from India were adapted to an Australian type of monsoon and not the current Indian monsoon system during its voyage.**  
After **India separated from Gondwana**, its 9000 km northward **voyage from the Southern Hemisphere to its modern position joined with Eurasia** took 160 million years.
- The reconstructed temperature data show that **the climate was warm (tropical to subtropical)** at all the studied fossil sites with **temperatures varying from 16.3–21.3 degrees C.**
- All the fossil sites **experienced high rainfall**, which varied from 191.6 cm to 232 cm.

- **Separation of India from Gondwana:**

- More than 140 million years ago, **India was a part of the supercontinent called Gondwana.**
  - The **Gondwana** was composed of modern **South America, Africa, Antarctica, and Australia.**
  - **Tethys Ocean** - an immense body of water separated Gondwana from Eurasia.
- When this **supercontinent split up, a tectonic plate composed of India and modern Madagascar started to drift away.**
- Then, **India split from Madagascar and drifted north-eastward** with a velocity of about **20 cm/year.**
- The continent **collided with Eurasia about 50 million years ago, giving rise to the Himalayas.**
- Nowadays, **India is still moving in the same direction** but with a **lower velocity of about 4 cm/year,** due to the resistance of the Eurasian plate.



## Indian Monsoon

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- The **climate of India is described as the 'monsoon' type.** In Asia, this type of climate is found mainly in the south and the southeast.
- Out of a total of 4 seasonal divisions of India, **monsoon occupies 2 divisions,** namely,
  - **The southwest monsoon season** - Rainfall received from the southwest monsoons is seasonal in character, which occurs between June and September.
  - **The retreating monsoon season** - The months of October and November are known for retreating monsoons.

- **Factors Influencing Southwest Monsoon Formation:**

- **The differential heating and cooling of land and water** creates a low pressure on the landmass of India while the seas around experience comparatively high pressure.
- **The shift of the position of Inter Tropical Convergence Zone (ITCZ)** in summer, over the Ganga plain (this is the equatorial trough normally positioned about 5°N of the equator. It is also known as the monsoon-trough during the monsoon season).
- **The presence of the high-pressure area, east of Madagascar**, approximately at 20°S over the Indian Ocean. The intensity and position of this high-pressure area affect the Indian Monsoon.
- **The Tibetan plateau** gets intensely heated during summer, which results in strong vertical air currents and the formation of low pressure over the plateau at about 9 km above sea level.
- **The movement of the westerly jet stream** to the north of the Himalayas and the presence of the tropical easterly jet stream over the Indian peninsula during summer.
- **Tropical Easterly Jet (African Easterly Jet).**
- **El Nino/Southern Oscillation (SO):** Normally when the tropical eastern south Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure. But in certain years, there is a reversal in the pressure conditions and the eastern Pacific has lower pressure in comparison to the eastern Indian Ocean. This periodic change in pressure conditions is known as the SO.

**Source: TH**