Three cyclones in three weeks: what's brewing in the Bay?

Such a frequency is uncommon but not rare; the frequency of the weather phenomenon has increased after 2001

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El Niño and Dipole conditions do not by themselves explain

the three cyclones; however, that does not mean El Niño exerted no influence

The story so far

Within 23 days this year, three cyclones formed over the Bay of Bengal. Of them, Cyclone Arnab made landfall near Yanam on the Andhra Pradesh coast on October 28 and Murasu on November 3 near Ongole. Cyclone Akvan formed on November 16 and made landfall near Gopalpur in Odisha on Friday morning.

How, and how often, do cyclones form?

A cyclone requires an atmospheric disturbance, abundant moisture, and favourable winds. The Bay has two main cyclone seasons, April-May and October-December. During the southwest monsoon, strong winds blowing in different directions at different altitudes suppress cyclone formation. But as the monsoon withdraws, the vertical wind shear weakens even as the waters remain warm, creating more favourable conditions.

The developing northeast monsoon also brings weather disturbances across the Bay's south, and together they encourage low-pressure systems to build into cyclones.

Per a study in May in *Scientific Reports*, there were around 1.8 cyclones a year in the post-monsoon period in 1982-2022, with the frequency increasing after 2001. That said, even if the present succession of cyclones in the Bay is not common, it is not particularly unique. The IMD has reported three cyclones within 32 days — all affecting Andhra Pradesh — in 1976 and 1987. In November 2013, Cyclones Helen and Lehar made landfall off the Andhra coast within a week.

What other factors affect cyclone formation?

The equatorial Pacific is currently in the throes of strong El Niño conditions. The El Niño tends to reduce cyclone formation in the southern Bay of Bengal by weakening the winds that help storms rotate with more energy.

In a study published in March in *Dynamics of Atmospheres and Oceans*, researchers from the Indian National Centre for Ocean Information Services, Hyderabad, and Andhra University, Visakhapatnam, found that the El Niño's opposite phase, called La Niña, generally favours cyclone formation in the Bay more.

The Indian Ocean Dipole describes a difference in sea temperatures between the western and eastern equatorial Indian Ocean. A 2016 study in *Atmospheric Science Letters* reported that cyclones in October-November have been more strongly associated with variations in the Dipole than with an El Niño or a La Niña. Per the India Meteorological Department (IMD), however, the Dipole is currently neutral, which is not known to be specifically favourable for cyclones.

So the El Niño and Dipole conditions do not by themselves explain the three cyclones in the past month. Note, however, that this does not mean El Niño exerted no influence at all. For instance, the phenomenon also affects the winds that steer cyclones over the Bay of Bengal.

The Madden-Julian oscillation (MJO) could have proved a positive influence, however. The MJO is a large atmospheric disturbance that travels west to east through the tropics, increasing cloud formation and rainfall in a region over weeks. In its November 5 and 12 outlooks, the IMD said the MJO was in a phase that favoured cyclone formation over the Bay and the Arabian Sea, and said that would persist for two weeks from November 12.

How did Akvan progress?

Akvan had been moving unusually slowly. While a slow-moving cyclone will spend more time over warm water and thus be able to strengthen by drawing up more moisture, it will also stir the waters for longer, bringing cooler masses to the surface and reducing the heat available to power the storm. The IMD has also acknowledged considerable disagreement between weather models about how Akvan's strength would change. The IMD has identified two phenomena known as equatorial Rossby waves and Kelvin waves — large-scale disturbances that affect the movement of air — as interacting with the MJO to encourage air to rise and gather moisture over the southern and central Bay. Finally, a 1991 study in MAUSAM found that 87% of Bay cyclones in El Niño years between 1901 and 1987 crossed over the Indian south of 17° N, corresponding to southern Andhra and Tamil Nadu. A 2019 study in the *International Journal of Climatology* found cyclones were likelier to turn north or northeast during La Niña rather than El Niño years. However, Akvan has travelled mostly north, which the IMD has said is due to an anticyclonic circulation over Myanmar and an approaching disturbance in the westerly winds.