

# WHAT CAUSED THE EXTREME RAINFALL OVER CHENNAI ON 1<sup>ST</sup> DECEMBER 2015

Extreme rainfall events in India have increased by 50 % over the past 50 years. Are all extreme rainfall events related to global warming? On 1<sup>st</sup> December, 2015, Chennai received a record breaking 494 mm of rain within 24 hrs. At least 250 people died in the ensuing floods. Was this related to global warming? In a recent paper Jayesh Phadtare , Jeremy Grantham fellow, has shown the impact of Eastern Ghats and a “cold pool” on extreme rainfall in Chennai. The Bay of Bengal is a rich breeding ground for tropical storms. Once formed, they move westwards and cause heavy rain over the east coast of India. During winter monsoon, rainfall accumulations of 100 to 200 mm in a day are normal over Chennai. The Eastern Ghats with a mean altitude of 750 m, are about 200 km inland. In the winter monsoon, winds blow from east towards the Eastern Ghats. The winds do not always rise over the mountains. They do so only when they have enough kinetic energy. Moreover, when it rains the raindrops evaporate, cooling the air in that region. This cold air near the surface, is known as the ‘cold pool’ (CP). It takes more energy to lift the

cold air over the mountains. At low wind speed the cold pool becomes stationary and its depth can reach around 1 to 2 km. The edge of the stationary cold pool can extend hundreds of kilometers ahead of the mountain. The warmer, and hence lighter, oceanic winds get uplifted well ahead of the mountain by the cold pool. Thus, winds get blocked even before they reach the mountain walls by the invisible walls of cold pool (see figure). This occurred on 1<sup>st</sup> December over Chennai. The uplifting of air by the stationary cold pool resulted in continuous rainfall over Chennai. The role of the cold pool and Eastern Ghats were explored by using a weather forecast model. In a computer simulation of this event (with no Eastern Ghats), the cold moved inland away from Chennai. With this understanding of the underlying mechanism, extreme rainfall over the coastal zone can be predicted with greater confidence.

Reference: J. Phadtare, Role of Eastern Ghats Orography and Cold Pool in an Extreme Rainfall Event over Chennai on 1 December 2015. Monthly Weather Review, 146, 943-965, 2018.

