
Camel-Ride Push of Winds and Topography Favor the Flushing Out of Air Pollution from the NCR Delhi and Indo-Gangetic Plains

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
I am glad to present the December issue of the Current World Environment. The editorial of this issue highlights the importance of geographical location of the National Capital Region of Delhi (NCR Delhi) and explains the crucial role of topographical and meteorological conditions in air pollution transport along the Indo-Gangetic Plains upto the Bay of Bengal (BOB).

The geographical coordinates of Delhi are 28.7° N, 77.1° E. The National Capital Region (NCR) Delhi is located to the south-west of the Himalayas, north-east of the Thar Desert, and to the north-west of the central plains. During summers (including monsoon), south-westerly (SW) winds blow which bring monsoon rains while during winters, western disturbances (WD) are experienced. The WD storms are originated in the Mediterranean region that bring sudden winter rains to the northwestern parts of the Indian subcontinent.¹⁻² The moving parcel picks up moisture from the Arabian sea (AS). The moisture content of the air is increased significantly (from around 4 kg m⁻² to around 25 kg m⁻²).³ During winters, the southern hemisphere is heated because of that low pressure created over Southern Indian ocean that marks shifting of ITCZ (Inter-tropical Convergence Zone) towards south. This favors air movements from India to the Indian Ocean during the winters of the northern hemisphere. Such atmospheric processes have been studied during Indian Ocean Experiment (INDOEX) comprehensively. Infact, the air coming from the Europe is very cool. This feature brings winters (low ambient temperature) together with the inversions, higher density of air, low wind speed,

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relatively stable atmosphere, poor dispersion, higher stagnation, longer interactions of polluting species, less rain and poor wet scavenging (as compared to the monsoon period). These WD airmasses are responsible for long range transport of pollutants in the Indian region.⁴⁻⁵

The pollutants are trapped in a belt ranging from Punjab in the west to Bay of Bengal (BOB) in the east. The airmasses pass through the Indo-Gangetic plains flushing out the pollutants to the BOB. The Himalayan ranges help in splitting the westerly jet streams into two branches, from which, the southern stream enters into Indian subcontinent.⁶ In this regard, ISRO-GBP has conducted a campaign called ISRO-GBP Land Campaign II during 2004 winters when atmospheric chemistry and transport were studied starting from Hisar near Punjab to Kharagpur near BOB.⁷⁻⁸ Later during another ISRO-GBP campaign called Integrated Campaign for Aerosol Radiation Budget (ICARB), the status of atmospheric composition over BOB and AS has been reported with an interpretation for higher pollution level over BOB.⁹ The high speed winds (~200 km/h) when enter into the plains, turn into low speed and calm category fluid (~20 km/h). Chand and Singh have reported the average speed of such troughs as ~ 450 km/day.¹⁰ During this period, a stagnation is seen. But the immediate next air parcel of WD pushes the previous relatively stable parcel in the plains. This continues upto the BOB breaching the stagnation of pollutants. This process can be termed as a Camel-ride push which reduces the accumulation of air pollutants and helps in timely flush out of air pollution to the BOB.

The cool air parcel of WD which has entered into the surface air instead of moving eastward, hits the mountain barrier and the relatively warm airmass gets diverted to the plains from which it is further flushed out towards BOB. Thus, the Himalayan barrier helps in quick flushing of the pollutants to the BOB. Due to this effect, the pollutants are not stagnated for a longer period in the air of Delhi. It is observed that in the normal conditions (excluding episodic events such as Diwali, Crop residue burning etc), the local as well as the long range pollution is flushed out within 8-10 days as indicated by the levels of air pollutants.¹¹ Whenever, there is an accumulation of pollutants over a period of week or 10 days, the weather conditions at Delhi favor the occurrence of rain which also acts as a cleansing agent for the pollutants.¹² Also, such rains help in growing *Rabi* crops. The Natural rain is an effective scavenging process for the removal of both particulates as well as gaseous pollutants. An attempt of artificial rain might prove a mistake for another types of pollution crisis through atmospheric deposition affecting the ground, water bodies, human health and vegetation in the NCR and the Indo-Gangetic region.

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