

# **BOUNDARY LAYER CHARACTERISTICS ASSOCIATED WITH NORTHWESTERLY GAP WIND FLOW OVER THE KATHMANDU VALLEY**

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## **ABSTRACT**

Kathmandu valley is an elevated broad circular valley located in the middle hills of Central Nepal Himalaya. It is completely enclosed by mountains and hills but it has low-mountain passes in the western and eastern rim and a river gorge in the southwestern part of the valley. The northwesterly and southwesterly winds that, respectively, intrude from the western low-mountain pass and the river gorge constitute the prominent wind system of the valley. Understanding the boundary layer characteristics over an area of interest is very important as it plays a deterministic role in the nature of the air mass circulation over the area. In this paper, we will present the boundary layer characteristics over Ain Danda low-mountain pass from where the northwesterly wind intrudes into the valley and at the center of the valley where it merges with southwesterly as revealed by two-weeks long field measurements at each site by deploying a Monostatic Flat Array Sonic Detection and Ranging (sodar). The study shows that the Ain Danda pass channels northwesterly winds into the valley during the daytime whereas it drains air mass out of the valley during nighttime. The speed of the daytime wind often exceeds 6.5 m/s during the late afternoon. Nighttime stable layer was highly fluctuating with an average around 300 m and daytime mixing layer height was suppressed limiting it in between 285-350m above the ground in early part of the day but reduced to 140 m during the late afternoon. Comparison of diurnal variation of mixing layer height at Ain Danda with that of the central area of the valley floor strongly suggests that air mass intruding into the Kathmandu valley through this pass is a cool density flow over the weakly stratified mixed layer of the valley. Further investigations on the boundary layer characteristics associated with southwesterly wind and with the wind channeling out into the eastern valley and their implications on the air pollution dispersion over the valley will also be discussed.

**KEYWORDS:** Sodar, Boundary layer, Gap flow, Mixing layer