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Accumulation of Cold Air and Excitation of Large Scale Gravity Current over the Mid-Hills of Nepal – A Potential Site for Regional Radionuclide Monitoring

Monitoring radioactive gases and particulate matter is essential for verifying non-proliferation treaties. Nepal and its surrounding region currently lack a Comprehensive Nuclear-Test-Ban Treaty Organization International Monitoring System station. Among potential locations, Kathmandu stands out as a logical and promising site for background radionuclide monitoring. However, reliable data can only be collected if the site is well-coupled with regional atmospheric flows. This paper analyses the local and regional airflows in the Kathmandu Valley and assesses how strongly they are connected. The results show that the valley's local wind system is effectively linked with westerly and southwesterly regional flows, making Kathmandu a suitable site for regional radionuclide monitoring. The paper also identifies a previously unknown atmospheric phenomenon: a large scale easterly gravity current over the middle hills of the Central Nepal Himalaya. This gravity current forms when cold air masses build up in the northeastern mountains of the Kathmandu Valley. It can travel over 200 km, reaching the foothills of western Nepal. The effect of this gravity current on radionuclide monitoring, however, remains unexplored.

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