

**Comparison of two methods for ground level vapour sampling and influence of meteorological parameters on its stable isotopic composition at Roorkee, India**

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**ABSTRACT**

Ground level vapour (GLV) samples were collected at Roorkee, Uttarakhand, India using two methods: liquid condensation (LC) at 0 °C and cryogenic trap (CT) at -78 °C for the period 2009–2011. The study reveals that there is a considerable fluctuation in stable isotopic composition of GLV throughout the year. The study area receives complex moisture source during different seasons, which is evident from the moisture flux received during different seasons. The isotopic composition of the GLV in both methods shows depleted nature during rainout process. CT method shows exact isotopic signature of GLV because of maximum trapping of air moisture and its condensation, whereas LC method shows depleted or enriched character because of the prevalence of kinetic and diffusive fractionation. The  $d$  value shows that LC method acts as magnifier of the CT method and clearly shows seasonal effect than the clustered CT method. Hence, to decipher the original isotopic signature of GLV, isotopic composition of  $GLV_{LC}$  can be converted to  $GLV_{CT}$  by deriving an empirical relationship with changing season and locations.

Meteorological parameters show varied behaviour with  $GLV_{CT}$  and  $GLV_{LC}$  because of moisture sources in all seasons. The  $GLV_{CT}$  and  $GLV_{LC}$  method shows significant correlation with meteorological parameters when the region is dominated by single moisture source. The  $GLV_{LC}$  method magnifies the correlation with meteorological parameters when the region is influenced by more than one source. The study shows that the  $GLV_{LC}$  methods can be used in place of  $GLV_{CT}$  when the objective is to understand the influence of different moisture sources on GLV.