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Sr-Nd isotopic signatures indicate the provenance and depositional process of loams in the Tottori coastal dune

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Isotopic analyses of strontium and neodymium suggest that layers of loam intercalated in dune sand on the Japan Sea coast at Tottori, western Japan, mainly consist of Asian dust particles from China. An outcrop exposure shows a succession of late Pleistocene dune sand, a lower loam layer, Daisen-Kurayoshi Pumice (DKP; 50~55 ka or older), an upper loam, Aira-Tn tuff (c. 30 ka), and Holocene dune sand, in ascending order. Bulk samples of the loam layers show an upward increase in $^{87}\text{Sr}/^{86}\text{Sr}$, suggesting that the contribution of Asian dust increases upward. The Sr isotopic values also suggest a greater contribution of Asian dust in the silt fraction than in the bulk sample. Asian dust transported by westerly jet from the Taklamakan or Gobi desert is the main constituent of the upper part of the lower loam, of which isotopic values of silicate portion is isotopically identical to those of those desert sand ($^{87}\text{Sr}/^{86}\text{Sr}$, 0.717~0.719; ϵ_{Nd} , -9.5~-9.4). In contrast, the Sr and Nd isotopic values of DKP ($^{87}\text{Sr}/^{86}\text{Sr}$, 0.705; ϵ_{Nd} , -2.6~0.6) are close to those of the volcanic rocks of Mt. Daisen, which is regarded as the source of the tephra. The isotopic signature suggests that Asian dust also have contributed to the upper part of the upper loam layer. The upward increase of $^{87}\text{Sr}/^{86}\text{Sr}$ within each of the loam layers suggests that the contribution of Asian dust increased as the proportion of reworked deposits from the underlying layer (dune sand or DKP) decreased by burial. In contrast, $^{87}\text{Sr}/^{86}\text{Sr}$ in DKP shows little vertical change, suggesting very rapid deposition without entrainment of the underlying lower loam layer.

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Keywords: Eolian dust, Loess, Coastal dune, Strontium and neodymium isotopes