

Supplementary material

Observations of PSI technique:

In the current study, we examined a number of radar data from 2015 to 2022. To maintain the coherence of the data set, the Single Look Complexes (SLC) images were used after carefully examining the distribution of the temporal baseline (Dumka et al., 2021; Joshi et al., 2023; Luirei et al., 2023 and references therein). For the interferogram production and to eliminate the topographic phase contribution, the 1 arc-second DEM has been used. The tool (hyp3_gamma plugin version), as provided (Perissin et al., 2011; Perissin et al., 2012; Malik et al., 2019), continues to process the SLC dataset. The detail method

The phase of interferometric ($\Delta\phi_{\text{int}}$) is assessed using:

$$\Delta\phi_{\text{int}} = \Delta\phi_{\text{topo}} + \Delta\phi_{\text{displ}} + \Delta\phi_{\text{atmo}} + \Delta\phi_{\text{noise}} \quad (\text{S1})$$

The $\Delta\phi_{\text{topo}}$ referred as residual height due to topography; $\Delta\phi_{\text{displ}}$ = estimated displacement; $\Delta\phi_{\text{atmo}}$ = atmospheric phase disturbance; $\Delta\phi_{\text{noise}}$ = non-removable phase disturbance

A master image was set up to maintain the dataset coherence after looking into the temporal baselines (Fig. 4). For the monitoring of the millimeter level of deformation, the stable Persistent Scatterers (PSs) were identified after the phase difference estimation (Ferretti et al., 2007; Gabriel et al., 1989; Massonnet et al., 1993; Sowter et al., 2013; Vajedian et al., 2015). The reflectivity map of the area is generated, which is nothing but the temporal average of the amplitude of all the images used for processing. PS technique uses pixels with point-like scattering which do not suffer from geometrical decorrelation and thus remain coherent in all the interferograms (Foroughnia et al., 2019; Roccheggiani et al., 2019; Dumka et al., 2021). In the present study, we have identified 24820 PSs after keeping the Amplitude Stability Index (ASI) threshold value equal to or greater than 0.65. The ASI is given by the mathematical equation (Lei et al., 2013) as below:

$$\text{ASI} = 1 - (\sigma/\mu) \quad (\text{S2})$$

where, σ (sigma) and μ (mu) are the standard deviation and mean of the amplitude values, respectively. Generally, an ASI threshold of 0.4 or higher is significant. Further, the Atmospheric Phase Screen (APS) is estimated and compensated to improve the coherence of the PSs. InSAR measures the relative motion with respect to a point called as reference point that must be stable compare to all the PSs (Zhou et al., 2018; Dumka et al., 2021).