

Supplementary File

Updating Active Deformation Inventory Maps in Mining Areas by Integrating InSAR and LiDAR Datasets

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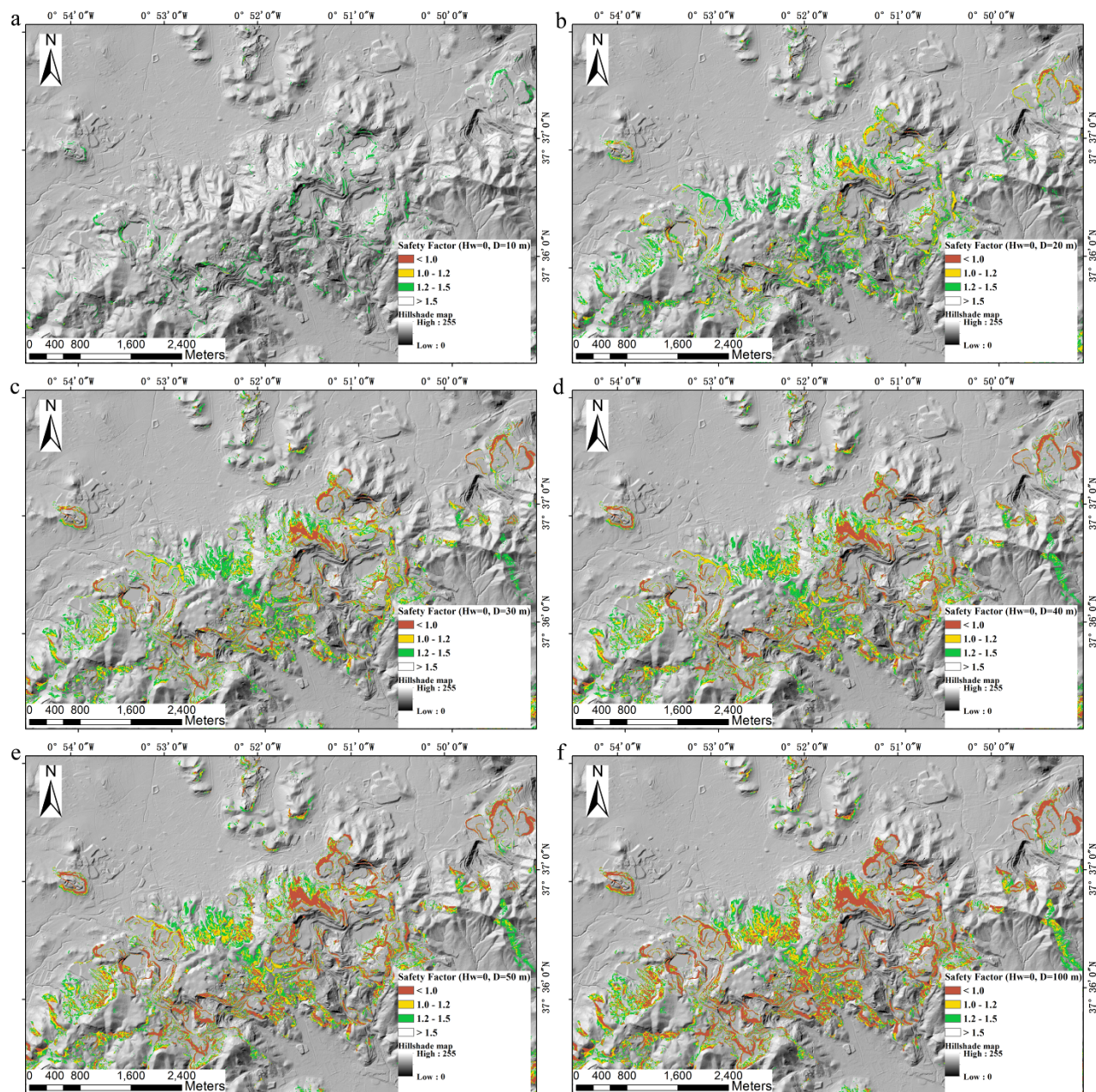


Figure. S1. Safety factor map computed by the infinite slope stability model in dry conditions (height of phreatic surface above slip surface, normalized relative to soil thickness, Hw equal to 0) for depth values of the slip surface (D) varying from 10 to 100 m.

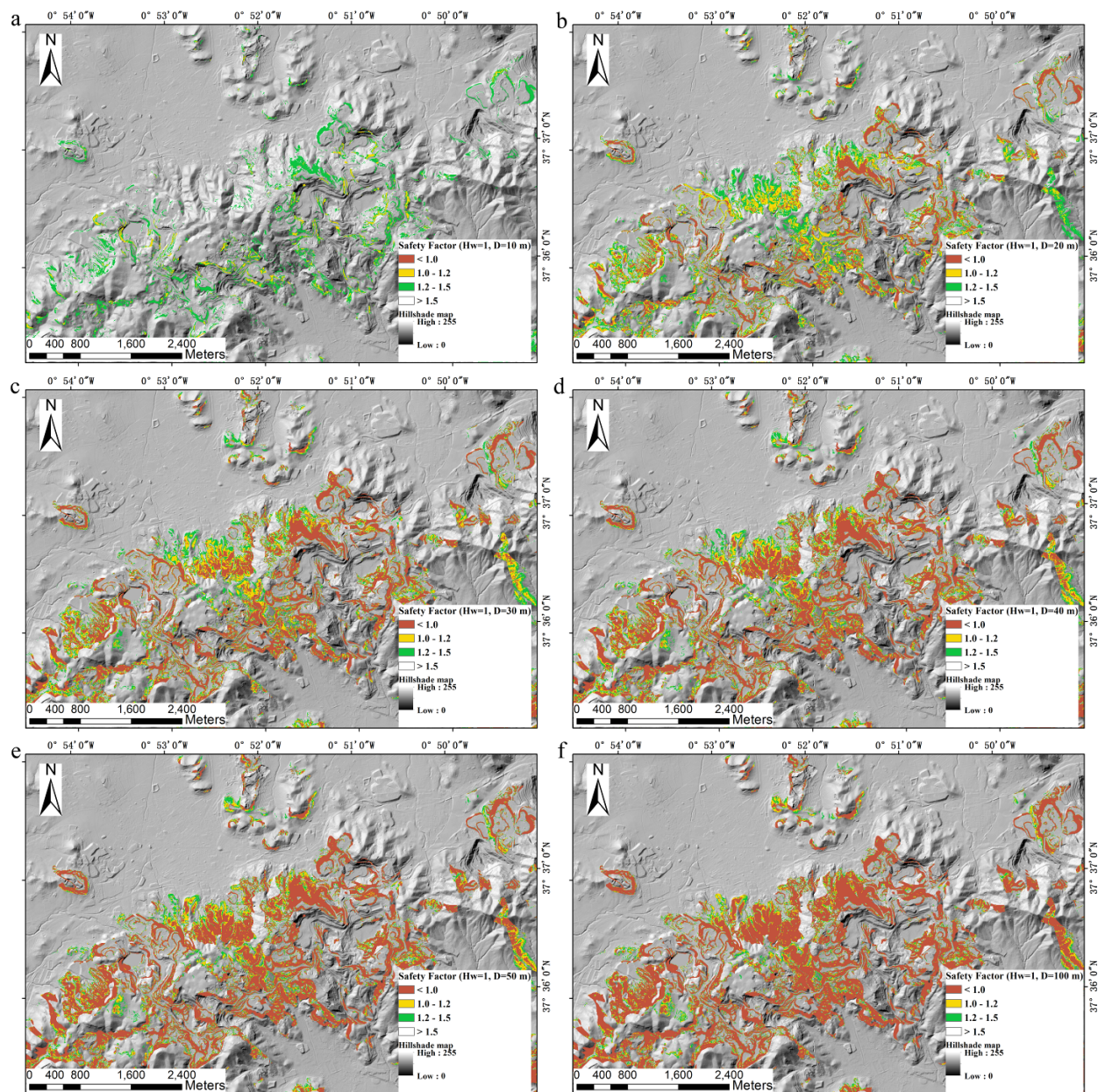


Figure. S2. Safety factor map computed by the infinite slope stability model in saturated conditions (height of phreatic surface above slip surface, normalized relative to soil thickness, Hw equal to 1) for depth values of the slip surface (D) varying from 10 to 100 m.

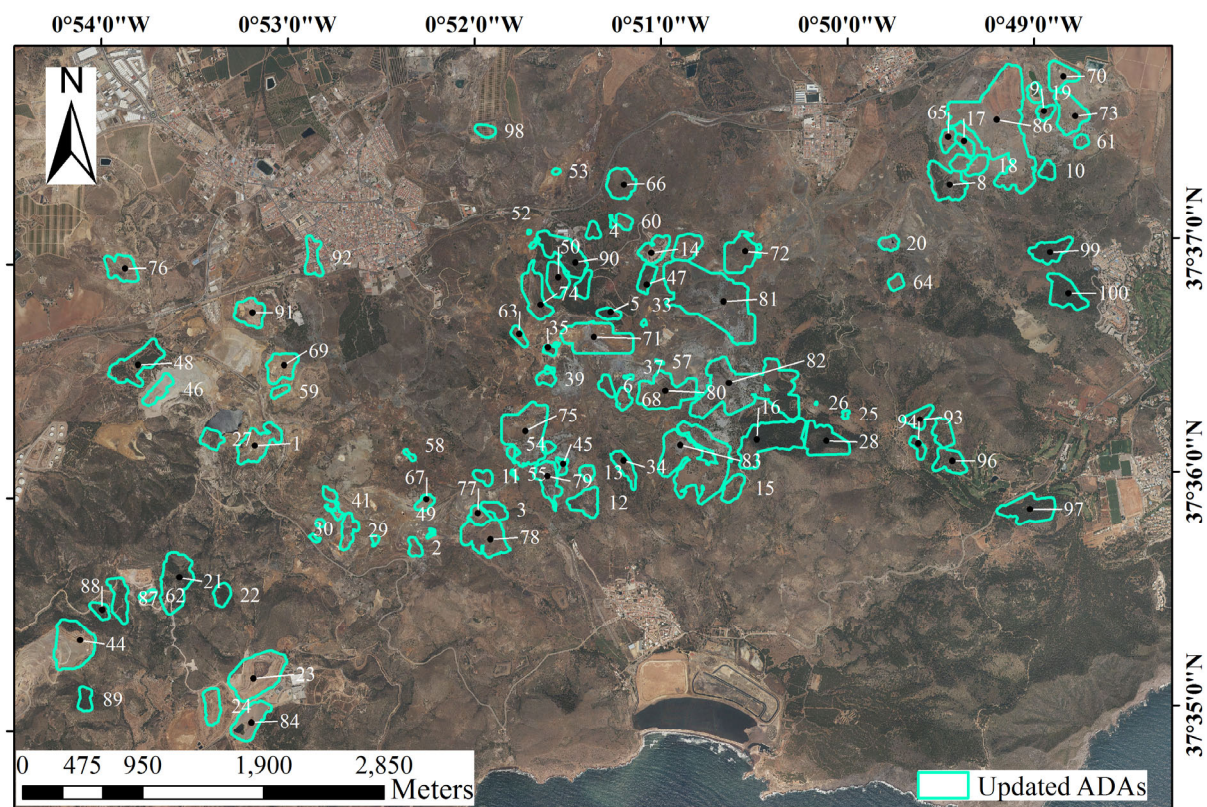


Figure. S3. Map of distribution of updated ADAs.

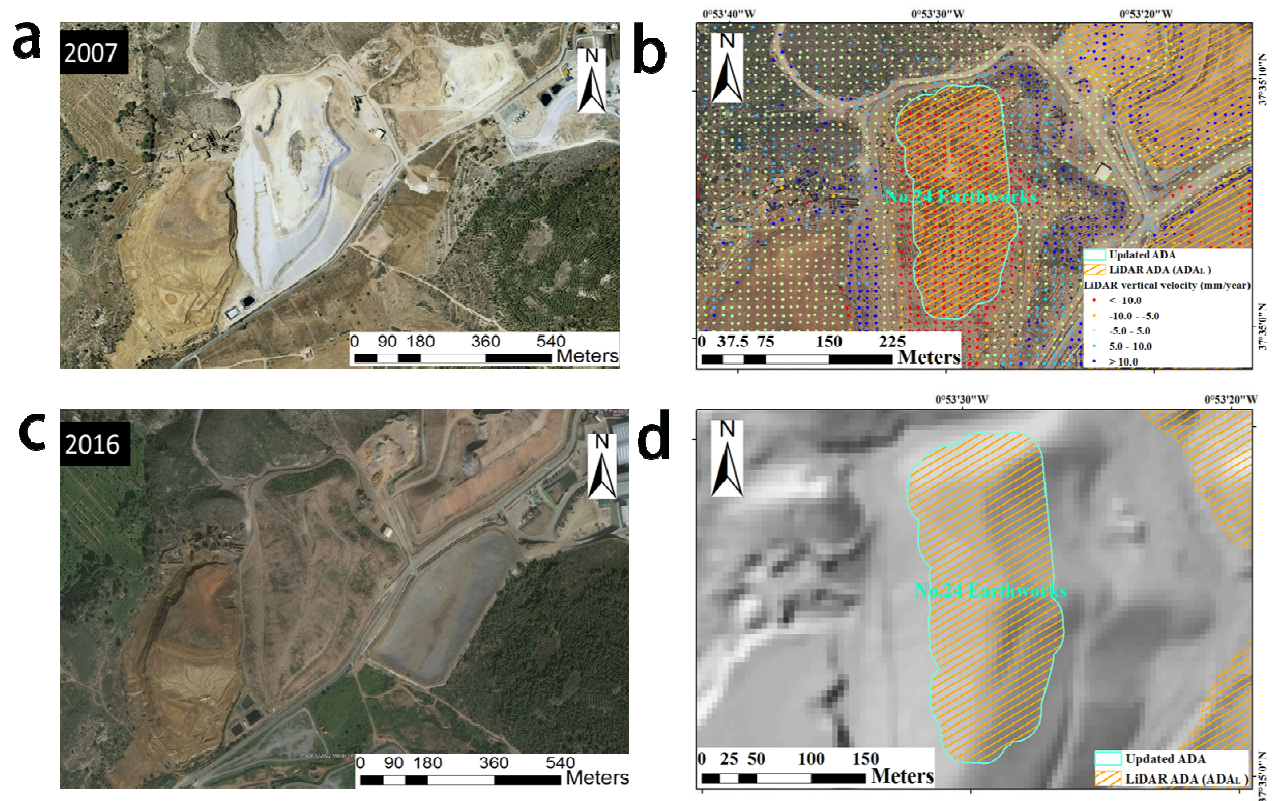


Figure. S4. ADA associated to earthworks: (a) and (c) Optical images of the ADA 24 (see location in Figure S3) from 2007 and 2016, respectively, in which the earthworks performed are clearly recognized. (b) LiDAR changes and contour of the ADA. Note that the magnitude of the changes reach up to -3 m in some areas of the ADA. (d) Shaded relief map with the updated contour of ADA 24.

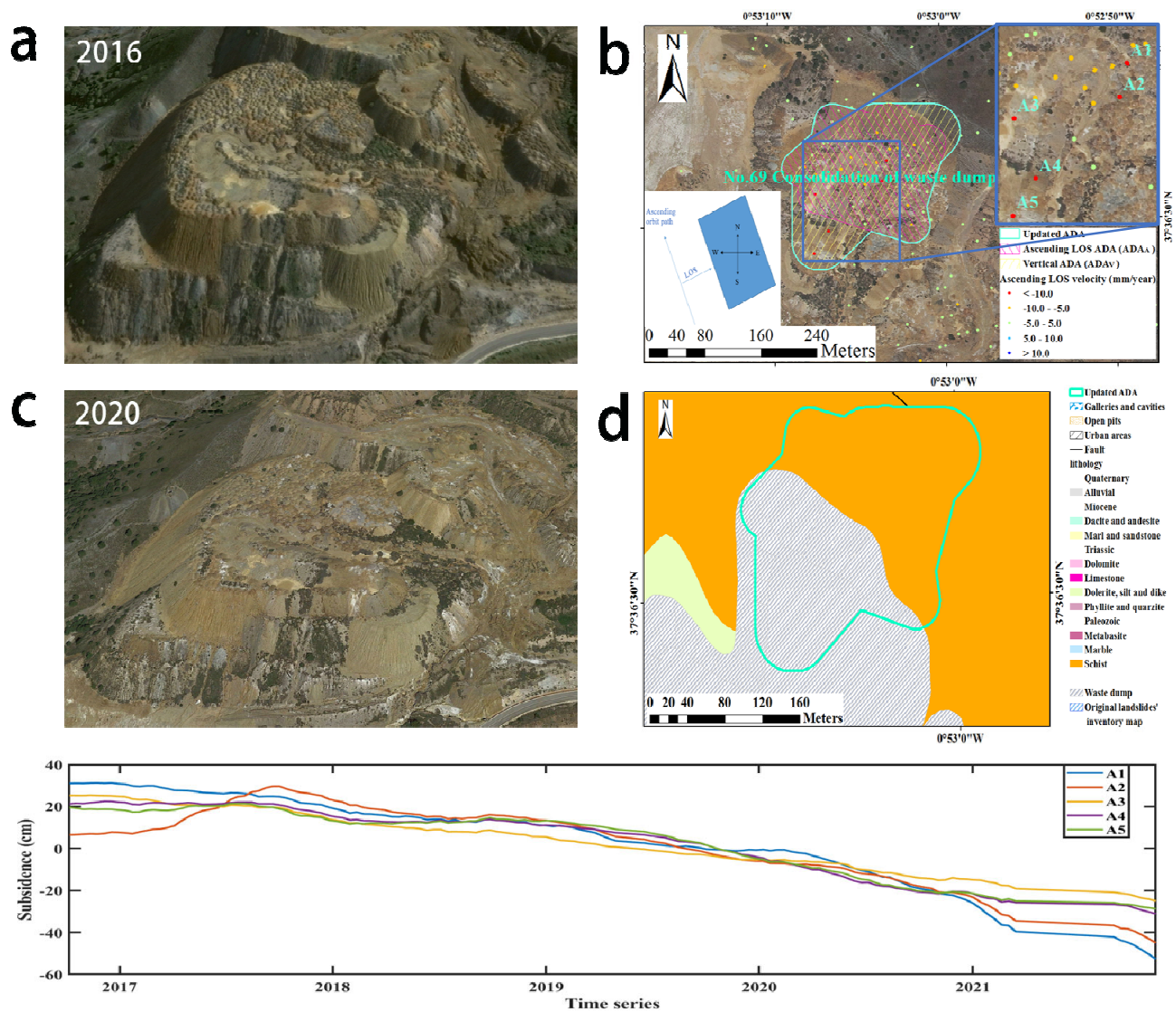


Figure. S5. ADA associated to the consolidation of a waste dump: (a) and (c) Optical images of the ADA 69 (see location in Figure S3) from 2016 and 2020, respectively. (b) InSAR displacements map and contour of the ADA_A and ADA_v. (d) Geological map of the ADA. (e) Time series of the ADA in which the gradual attenuation of the settlements is clearly recognized.

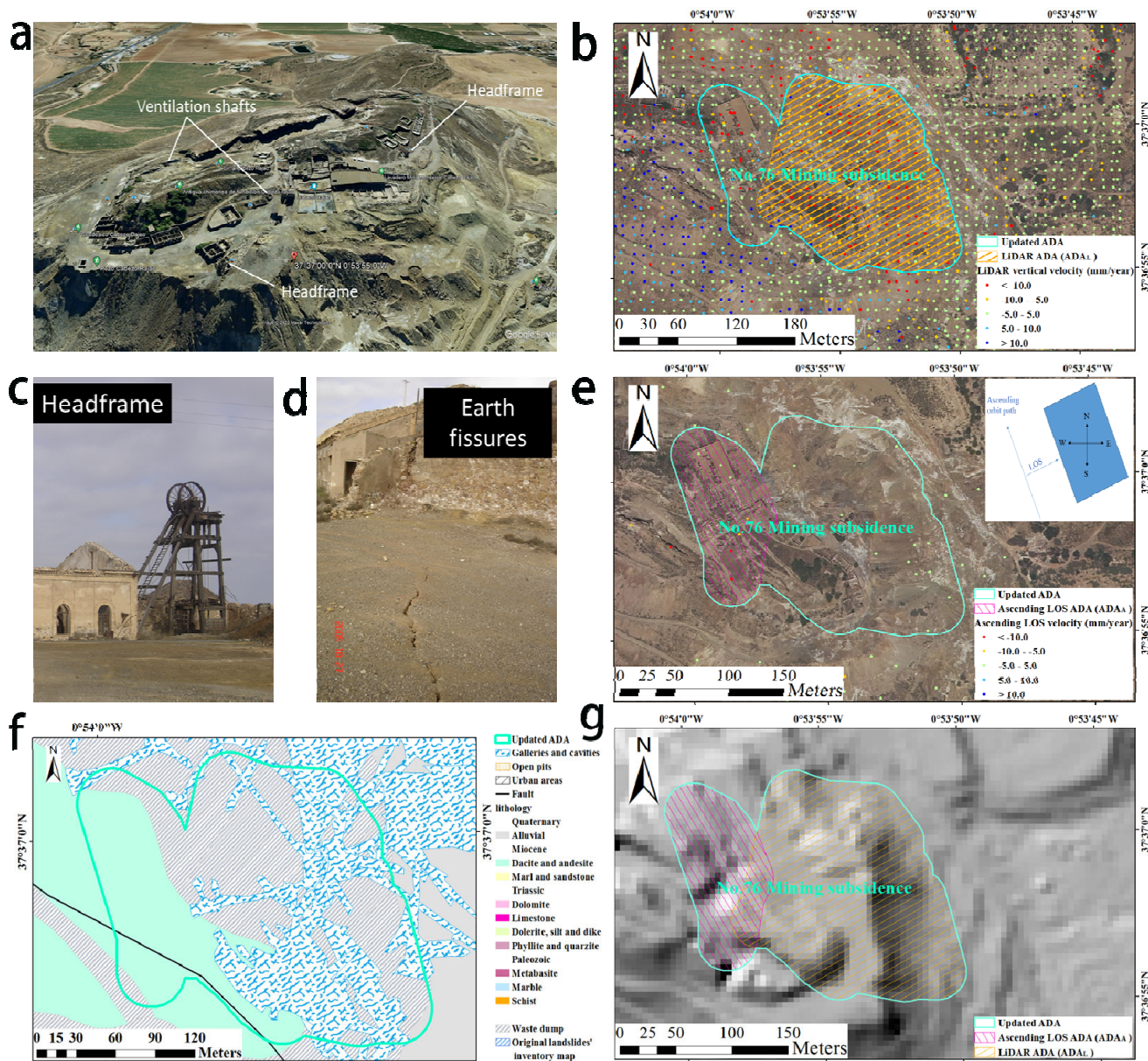


Figure. S6. ADA associated to mining subsidence: (a) 3D view of the ADA 76 (see location in Figure S3). (b) LiDAR results between 2009 and 2016 including the updated ADA contour. (c) Picture of a headframe placed within ADA 76. (d) Picture of an earth fissure identified on the ground surface of ADA76 related to mining subsidence. (e) InSAR displacements map and contour of the updated ADA. (f) Geological map of the ADA. (g) Shaded relief map of the ADA 76 with the contours of the ADAs detected by LiDAR (ADA_L) and InSAR (ADA_A).

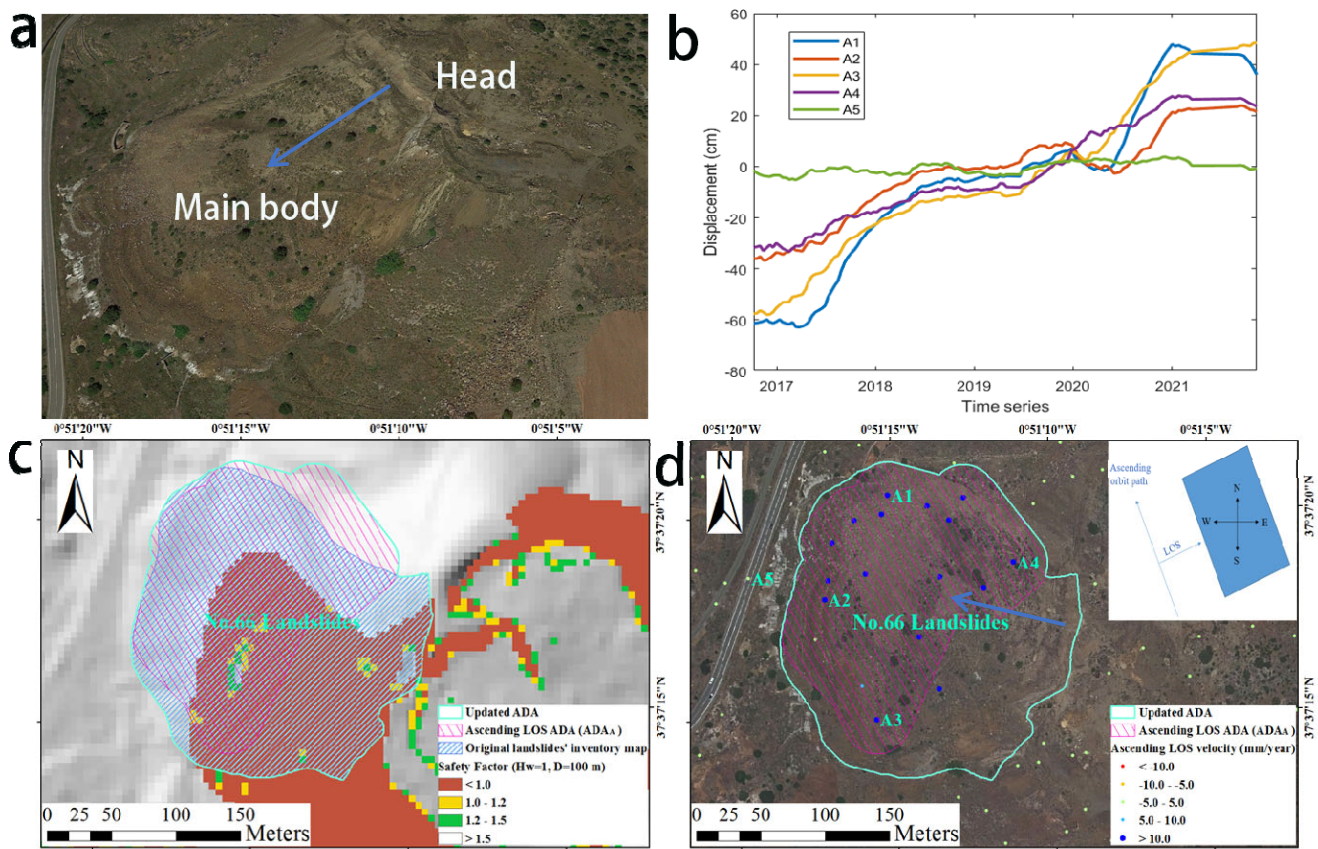


Figure. S7. ADA associated to a landslide: (a) 3D view of the ADA 66 (see location in Figure S3). (b) InSAR time series of some points placed within and out of the ADA. See location of the points in Figure S7d. (c) Shaded relief map with the contour of the ADAs detected by InSAR (ADA_A), the landslide mapped in the original landslides' inventory map, and the safety factor calculated by means of the infinite slope model. (d) InSAR displacements map and contour of the updated ADA.

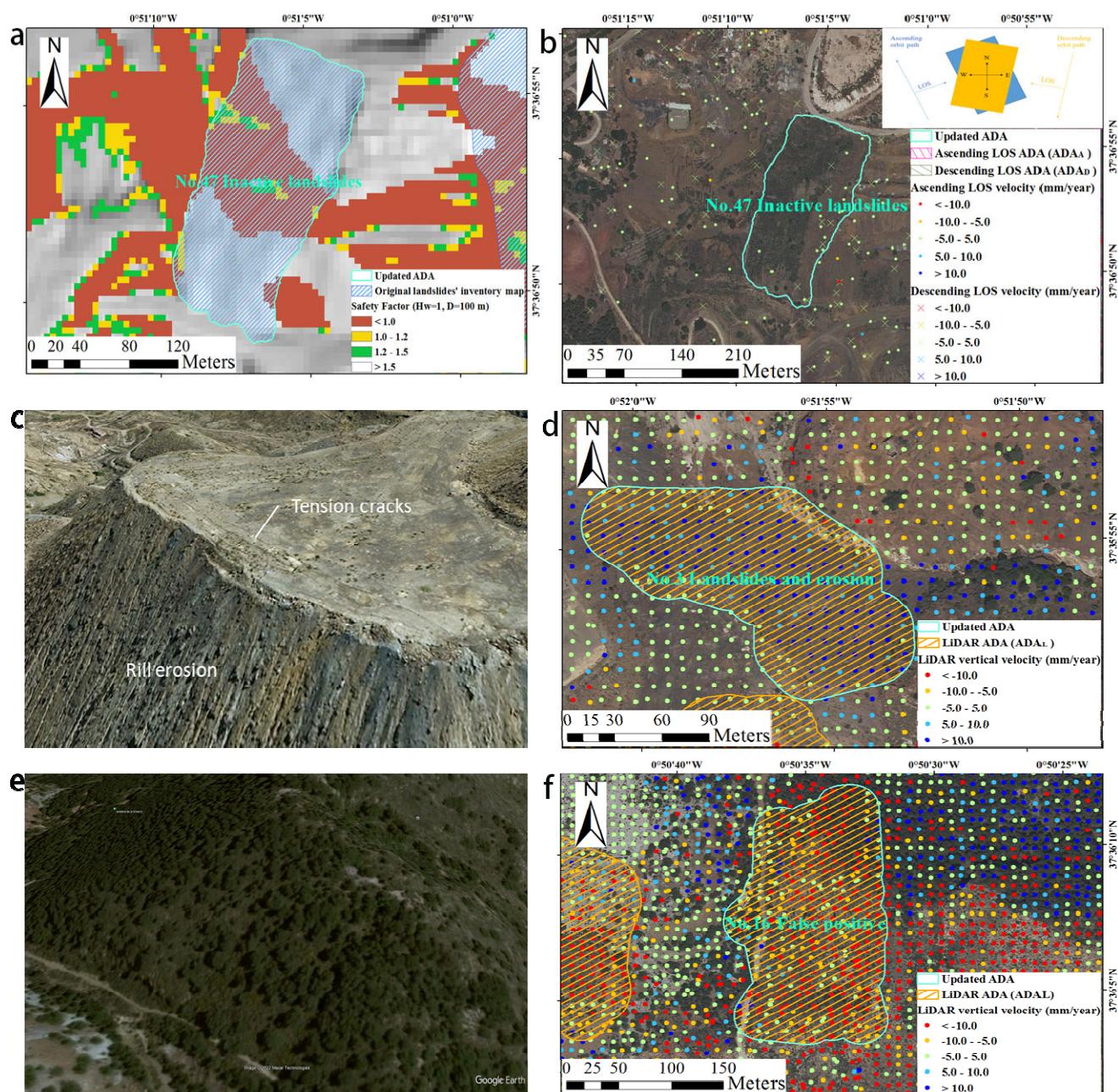


Figure. S8. Safety factor map and landslide contour of ADA 47 (see location in Figure S3) (a) and InSAR ascending and descending results mapped in the original landslides' inventory map (b). 3D view with indication of some geomorphological features of the underlying processes (c) and LiDAR results (d) of ADA 3 (see location in Figure S3) affected by a landslide and erosion. 3D view of a possible false positive ADA (e) and its LiDAR results (f) (ADA 16; see location in Figure S3).