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Can vegetation indices predict slope (stability) conditions?

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Climatic conditions and vegetation cover influence the water flux in a dike body, which affect the effective stress and self-weight, hence its stability. The vegetation is the intermediate layer between the atmosphere and the soil, and therefore this layer influences the boundary water flux by transpiration and leaf interception, so considering vegetation in numerical analysis of slope stability provides insight into changing stability. This study investigates Soil-Vegetation-Atmosphere (SVA) interaction impact on macro stability of grass covered dikes. Two numerical models have been used in the current study: (i) a crop model for simulating the water balance in the root zone (unsaturated zone); (ii) a Finite Element Method (FEM) coupled to the crop model for hydro-mechanical and safety analysis to calculate the Factor of Safety (FoS). Results of idealised analysis show that the Leaf Area Index (LAI) is coupled to the moisture in the root zone with a time lag, therefore, it is likely that it could be used as an indicator of safety. This proof-of-concept study enables dike managers to use the mentioned parameters as a proxy to identify vulnerable locations along a dike even in an early stage due to the lag correlation. This offers the opportunity to use remote sensing rather than physical inspection or installing sensors, along with history matching, to initially identify vulnerable locations along dikes.