Soil is the top layer of the earth's crust, which undergoes continuous degradation, induced by a variety of different factors, including unfavourable phenomenon of water erosion. In order to prevent it, it is necessary to get to know it thoroughly, at all stages.

Soil splash, frequently as the first stage of water erosion, occurs when a droplet of water hits the soil surface. This impact causes several phenomena. Soil particles detachment and displacement; aggregates destruction, soil surface deformation. This promotes subsequent surface runoff which causes soil material to be transported down the slope, impacting soil physical properties, cultivation and yields. Surface runoff can also cause dangerous mudslides. Moreover, soil splash can carry pollutants and pathogens or wash carbon and other nutrients. Good understanding and physical description of the water erosion at each stage is important because it will allow better counteracting it.

Soil splash is influenced by factors like slope, vegetative cover, precipitation, soil wettability, particle size distribution, moisture content and compaction. The combination of these quantities determines the amount and distance of transported matter. The origin of soil particles is obvious but the origin of splashed water is not clear (it can come from the falling drop and the soil). As pollutants and pathogens and nutrients, are found in soil water, it is important to know where the splash water comes from. Developed methodology of water isotope labelling and the results obtained can deepen research of water erosion and dependent phenomena (proposed technique has not been used in this type of research so far).

Labelled water has already been used in investigations of splash and surface runoff by colouring it. However, i) addition of dye can change water properties and alter the results; ii) determination of the degree of mixing is hardly or not possible. Caesium isotope labelling has been also used, however, it has similar flaw – it can change water properties.

Enriching water with a stable isotope of hydrogen (deuterium) can lead to production of a marker without such drawbacks. D_2O concentration in water can be monitored using isotope ratio mass spectrometry. Such spectrometry is widely applied in various areas environmental, geomorphological, environmental engineering, archaeological, energy science, medical and microbiological research. **However, it has never been used for monitoring splash and runoff phenomena, or soil and droplet parameters impact on these**.

The main aim of the project is to determine the origin of water from splashed water droplets depending on soil properties (moisture content, texture) or energy of hitting drop. There are two sources of this water origin: water from the drop hitting the soil surface and water present in the soil. The use of water labelling (by isotopes) makes it possible to determine the ratio of the water in the splashed droplets from both sources.

Project is planned as an another step towards a deeper understanding of the splash phenomenon and its consequences: Information about the origin of water in splashed droplets and the impact of soil and drop parameters on this phenomenon, which will help researchers to describe the transportation of pathogens or chemical contaminants as a result of splash more accurately. Moreover, project aim is development of a precise, easy-to-use, non-invasive and environmentally safe method of soil splash tracking (and possibly surface runoff in the future) with use of isotope water labelling. The advantage of this method, especially in comparison with the labelling methods used so far, is that the properties of water are not changed, and the method thus does not change the course of the studied phenomenon.