Citizen Science Projects (MOOC) 4.2

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SPEAKER: Soil moisture is an important factor in the global water cycle. Soil is one of the most important water reservoirs that directly provides water for plants and buffers the air humidity and temperature. Information on current soil moisture status is important for planning and forecasting soil related activities and climactic factors. Measuring soil moisture and high density is very costly. But by using satellite information, we can make it cheaper when huge areas are measured or estimated at the same time. The need for information on soil moisture was recognised by the European Space Agency when the Sentinel-1 satellite was launched in 2014 and 2016.	
This satellite family is equipped with radar sensors working at microwave wavelength as well as other important fields of use. One of the most important and fastest developing uses is soil moisture sensing. The microwave radiation penetrates the soil surface and part of the signal bounces back. The difference between the absorbed and the reflected radiation gives us the function of the properties of the surface, the soil, and the land cover. Soil moisture is one of these properties, but is not the only one. There are many others, like soil texture, salt content of the soil, clay content, and basically everything that influences the electric properties of the surface.	
We could easily calculate the soil moisture content if all other important contributing factors were known. But we do not know them, and they change rapidly in time and space. So we must go backwards. Remote sensing data interpretation always needs ground truth data,	

the surface measurements of the property in question. By knowing the real values and the satellite measurements for the same location and same time, one can develop statistical algorithms to calculate the soil moisture content from satellite data value. This process will never be perfect. But taking the time and cost needed to develop this data is the best and most effective approach to produce soil moisture data for large areas like Europe or for the entire globe.	
The accuracy depends mainly on the number and quality of ground truth data. The more ground data we have to calibrate the satellite data, the more precise and accurate algorithms and output can be developed. Therefore, the number of ground surface observation points has to be increased to cover all different soils, terrains, and land use patterns. We need to have an even density coverage of ground truth observation points all over the target area. Currently, this is the weakest point of the system. There are approximately 1,000 observation sites around Europe, including Russia, covering 10 million square kilometres. High tech soil moisture sensors are expensive. But there are now low cost sensors in the market, which can be installed easily.	
Information collected locally by sensors will support any soil related activity like gardening, cropping, or even construction work. And this information can be collected from several sites, increasing the network for soil moisture measurement and supporting satellite data calibration and validation as well.	
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