The « SmartStake », a device for autonomous and real – time monitoring of glacier ablation

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Glacier mass loss is increasing globally for the vast majority of glaciers over the last decades. Such increase in mass loss is partly attributed to increasing ablation related to both a lengthening and intensification of the melt during the melting period. Ablation measurement are commonly realised using wooden or plastic stakes inserted into the ice. This method, although efficient and cost-limited, provide a level of information on the amount of melt that depends on the frequency of the field campaigns. Therefore, the measurements of ablation stakes give the cumulative mass loss between two field campaigns which temporal frequency is rarely higher than a month. Here, we present a device called "Smart stake" that has been developed to perform an autonomous and real-time monitoring of the glacier melt over the entire ablation that requires only very limited human intervention. Measurement time step can be adjusted to the needs. Data can be remotely transmitted through different systems (GSM, LoRa, satellite) depending on the possibilities in the area.

The Smart Stake has been developed within the framework of the French National Glacier Observatory (GLACIOCLIM) and a partnership has been established with the company A2 Photonic Sensors to continue the development of the sensor. Several devices have been settled on the Mer de Glace and Argentière Glacier in the Massif du Mont-Blanc allowing complementing the classical network of ablation stakes that have been used to compare the results of the different methods. After four years of operation, the Smart Stake has proven to be robust and effective and shows promise for widespread deployment.