

Abstract

Dead ice bodies and kettle holes have been previously observed in research using geophysical methods and aerial imagery, but no studies have tried to correlate them and understand the formation of kettles because of dead ice melting in the field. This work aims to establish a novel technique to study the formation mechanism of young kettle holes in a proglacial environment by coupling both aerial and subsurface data. We will try for the first time in research, to see the formation mechanism of the kettles in action. Internal 2D ERT data identify melting buried ice in the Otemma floodplain (VS), surrounded by kettle holes. Aerial digital photogrammetry points out a more precise mechanism of formation of the kettle holes. Results from five orthophotographs coupled to 2D ERT data lead us to consider a new model of formation of the young kettle holes. This model consists of three steps: first the development of a ring of kettles around dead ice, then the coalition of these kettles, to finally form one big kettle at the surface. This model cannot always be observed in the field, because kettles are heavily impacted by the proglacial river. Flooding of the river is the main driver of disappearance of the kettles, and is also interpreted to avoid the formation of kettles. This makes the formation of kettle holes variable and complex to understand.

Keywords: Buried ice, kettle holes, ERT method, Aerial digital, photogrammetry, Otemma, proglacial environment