



Southern Patagonia Icefield freshwater calving glaciers recent collapses into deep lake waters

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The Patagonian Icefields are among the biggest worldwide glaciers contributors to sea level rise. In spite of ongoing deglaciation in Patagonia, climatic models are estimating that the icefields surface mass balances during at least the last 4 decades has been neutral or even positive. The main mass losses are therefore, mainly related to frontal ablation, namely surface ablation, calving and subaquatic melting. These are the predominant factors in almost every single calving glacier in the region, especially among the eastern glaciers of the Southern Patagonia Icefield that are ending into deep lakes. The only and most remarkable exception to this trend on the eastern side of the SPI is the well-known stable and even advancing state of glacier Perito Moreno. In spite of the relatively benign surface mass balances modelled for the last 4 decades, during the 2010's several freshwater calving glaciers experienced strong retreats, and in some cases, the collapse of the whole ice fronts with losses mounting several square kilometers of ice in single events or during a series of huge calving events. In order to study the glacier-lake interactions in the area, a collaborative research program was initiated in 2013 by Chilean and Argentinean scientists allowing the installation of a network of Automatic Weather Stations, fixed photographic cameras, water level pressure sensors and GPS stations at both sides of the international border. Since 2013 several field campaigns were conducted to the area including the survey of lake waters nearby several retreating glaciers. In most of the studied cases were detected very deep bathymetries (up to 600 m in places), and in some cases, a vertical structure of the lake water indicating a highly stratified condition that we estimate is responsible for very low subaquatic melting favoring the presence of glacier foets extending tens or even few hundreds of meters beyond the subaerial ice walls. The most remarkable recent collapses took place at glacières O'Higgins and Viedma, whilst the rest of our studied glaciers (Chico, Upsala and Dickson) also experienced retreats with smaller rates. In this presentation we will show novel data collected in the main freshwater calving glaciers of the SPI and will discuss the local conditions explaining the recent glacier behavior.

