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Surface mass balance and runoff modeling for the Northern and Southern Patagonia ice caps

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Mass-balance and freshwater runoff observations from the Southern (SPI) and Northern Patagonia ice caps (NPI) are limited. Here, we present winter and summer mass-balances and runoff simulations for both ice caps. The model development and setup permit relatively high-resolution (500-m horizontal grid; 3-h time step) SPI and NPI estimates for 1979 through present. Using MicroMet and SnowModel in conjunction with land cover (the Randolph glacier inventory), topography, and the NASA Modern-Era Retrospective Analysis for Research and Applications (MERRA) atmospheric reanalysis data, a spatially distributed and individual SPI and NPI dataset was created. SPI and NPI mass-balance and runoff variability were simulated and analyzed to highlight the spatial and temporal variability to adjacent seas. Both SPI and NPI faced, in average, increasing GIC mass-balance loss, where the individual drainage basins illustrated runoff variations.