COMPARISON OF A TIME SERIES OF SNOW ALBEDO FIELDS DERIVED FROM AGEING CURVE PARAMETERIZATION AND 35 MM TERRESTRIAL PHOTOGRAPHY FOR HAUT GLACIER AROLLA, SWITZERLAND

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From May to September 2001 a series of field observations have been performed on Haut Glacier Arolla (Swiss Alps): among others, five meteorological stations, positioned on snow or ice, continuously recorded temperature, humidity, wind speed and albedo. Precipitation can be regionalized from an automatic weather station which is situated in the valley below the glacier. A standard 35 mm camera, positioned on a ridge overviewing the lower part of the glacier, took a picture every day at noon. The camera images are georeferenced to the digital terrain model (DTM) of the region. The georeferencing technique consists in a mapping function between the recorded reflectance values in the photograph and a perspective projection of the DTM in camera coordinate system. This georeferenced image is the corrected for the effect of topography, atmospheric transmittance and input/output relationship of the camera-film-scanner system, in order to estimate the albedo of the snow surface. From the hourly meteorological records a time series of albedo fields is derived by spatial interpolation and application of an ageing curve parameterization, which considers the age of the surface snow layer and the air temperature. These hourly albedo fields have a spatial resolution of 10 m, and are validated with the measurements of albedo as recorded at the five station positions. Finally, the parameterized albedo fields are compared with the ones derived from the photographs. The procedure shows the accuracy of both methods, the parameterization having the higher temporal resolution, but requiring detailed meteorological observations, whereas 35 mm terrestrial photography being flexible and inexpensive.