



Towards a complete World Glacier Inventory

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The need for an inventory of the world's glaciers evolved during the International Hydrological Decade (1965-74). As a result, guidelines were established in the mid 1970s to compile a worldwide detailed inventory of existing perennial snow and ice masses. Following these international guidelines, several countries started compiling national glacier inventories based primarily on aerial photographs and maps. In the 1980s, the World Glacier Inventory (WGI) database was launched together with a status report about global and regional glacierised surface areas for the second half of the 20th century. These estimates were based on the detailed inventory data together with preliminary estimates of the remaining glacierised regions derived from early satellite imagery. In the late 1990s, the Global Land Ice Measurements from Space (GLIMS) database was initiated to continue the inventory task with space-borne sensors. In the WGI, glaciers are represented by geographical point coordinates. The GLIMS database includes digital outlines. Both include exact time stamps and tabular information on glacier classifications, length, area, orientation, and altitude range. Both are regularly updated with newly available data: the WGI stores point information for the second half of the 20th century whereas the GLIMS includes digital outlines for the 21st century.

Since these detailed glacier inventories are not (yet) globally complete, there have been several efforts towards preliminary estimates of the overall global glacier coverage. A first, well elaborated one was included in the original status report of the WGI, published in 1989, and was refined in 2005 with information from other sources by Dyurgerov and Meier. Other studies used the detailed WGI, or an extended format by Cogley, for regional or global up-scaling of glacier extents. In 2003, Cogley published a global map of percentage glacier coverage per $1^\circ \times 1^\circ$ grid box (GGHydro) that is widely used for modeling at global scale. A first globally and almost complete map with (generalized) digital outlines of all ice covered regions (incl. Greenland but excluding Antarctica) was derived from ESRI's Digital Chart of the World (DCW) and other sources by Raup and colleagues in 2000. Most recently, Arendt and colleagues produced the Randolph dataset which combines available outlines from the GLIMS, DCW, and WGI datasets as well as from many other (often unpublished) sources by using the highest quality version in each region. However, while having the advantage of being almost complete, these global estimates lack time stamps and attributes for individual glaciers.

The present work provides a brief review of the various efforts, its methodological differences, and findings towards the completion of a World Glacier Inventory.