

# Which glaciers are the largest in the world?



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A contribution to the RGI & GLIMS working group of the International Association of Cryospheric Sciences

## Challenges & approach towards a scientific answer

*Sounds like a trivial question which can be simply answered from a glacier inventory but...*

**Basic requirements** for a reproducible answer:

- definitions
- data availability
- data quality
- data consistency

**Definitions** (cf. Cogley et al. 2011)

- glaciers
  - excluding ice sheets
  - including ice bodies on Antarctic Peninsula
- “glacier” versus “glacier complex”
- glacier outline => area

**Data**

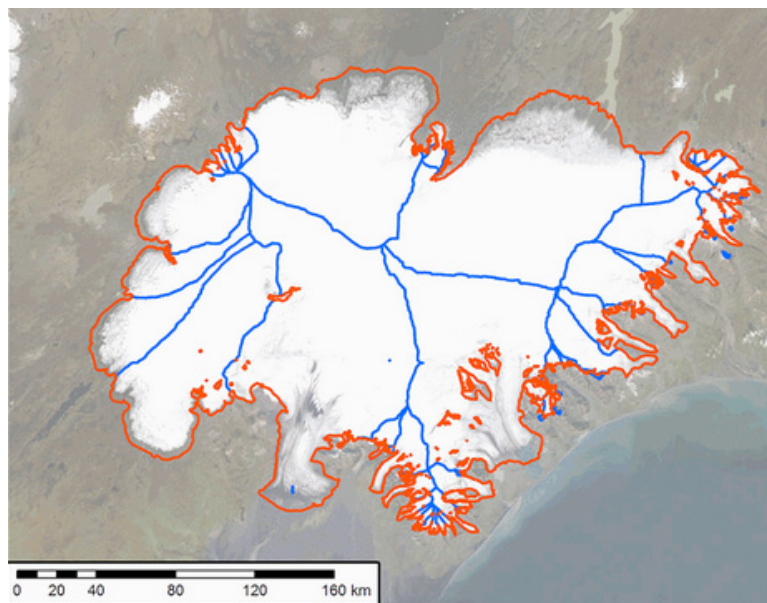
- Randolph Glacier Inventory (RGI) 6.0
- Global Land Ice Measurements from Space database (GLIMS, v20190304)

## Glacier versus glacier complex *(e.g. ice cap, icefield)*



Grosser Aletschgletscher

1 glacier



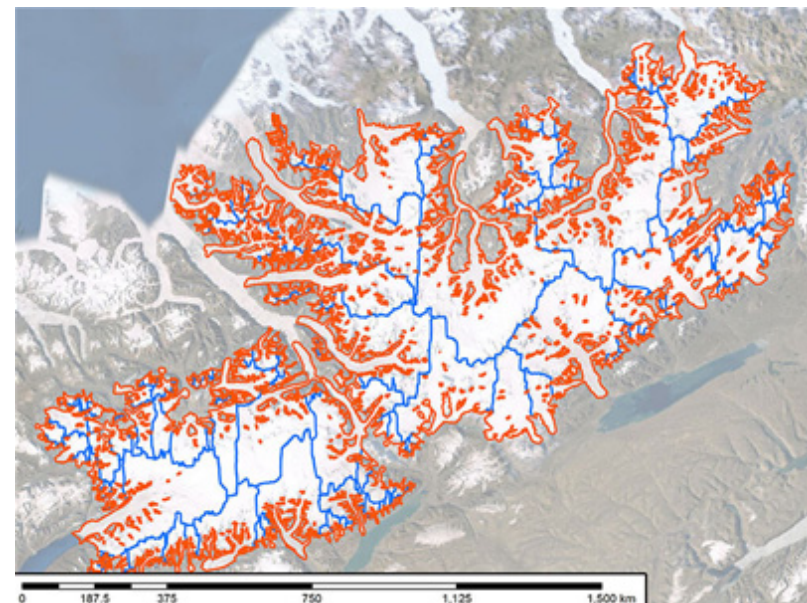
Vatnajökull Ice Cap

1 glacier complex

(GLIMS v20190304)

34 glaciers  
(RGI 6.0)

Largest glacier: Skeidararjökull



Northern Ellesmere Icefield

1 glacier complex

(GLIMS v20190304)

408 glaciers  
(RGI 6.0)

Largest glacier: M'Clintock Glacier



## The largest glacier complexes in the world

**Antarctic Peninsula  
ice complex**

Antarctica

80,852 km<sup>2</sup>

(partly considered as part of Antarctic Ice Sheet)

**Alexander Island  
glacier complex**

Antarctica

47,486 km<sup>2</sup>

**Malaspina-Seward  
glacier complex**

Alaska

30,195 km<sup>2</sup>

**Severny Island  
Northern Ice Cap**

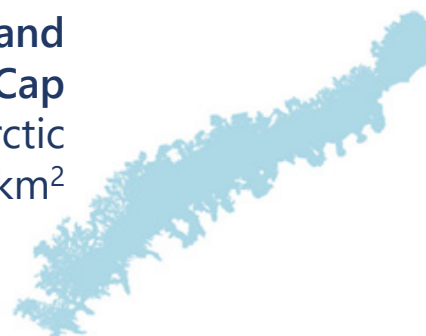
Russian Arctic

20,667 km<sup>2</sup>

**Northern Ellesmere  
Icefield**

Arctic Canada North

19,521 km<sup>2</sup>



## The largest glaciers in the world

Name	Region	Area (km <sup>2</sup> )	Year
Seller Glacier	Antarctic Mainland	7,018	2002
Thurston Island Glacier No. 1	Antarctic and Subantarctic Islands	5,261	1972
Alexander Island Glacier No. 1	Antarctic and Subantarctic Islands	4,766	1997
Alexander Island Glacier No. 2	Antarctic and Subantarctic Islands	3,980	1997
Mercator Ice Piedmont	Antarctic Mainland	3,499	2002
Malaspina-Seward Glacier	Alaska	3,363	2010
Wykeham Glacier South	Arctic Canada North	3,176	1999
Bering Glacier	Alaska	3,025	2010
Hubbard Glacier	Alaska	2,834	2010
Barnes Ice Cap South Dome North Slope Glacier	Arctic Canada South	2,771	2002



Seller Glacier



Thurston Island Glacier No. 1



Barnes Ice Cap South Dome  
North Slope Glacier



Wykeham Glacier South



Malaspina-Seward Glacier

## Remaining challenges

Weak connections of glacier complexes



Separation of individual glaciers

Hooker Island, Franz Josef Land

1 Glacier Complex

But how many glaciers?

RGI 6.0

- 16 glaciers (2006)

GLIMS (v20190304)

- 16 glaciers (2006, Landsat-7)
- 56 glaciers (2016, Sentinel-2)

Franz Josef Land, Copernicus Sentinel data by ESA



Which are the largest glaciers in the world outside the ice sheets?

## Conclusions

- can only be answered when differentiating between **glaciers** and **glacier complexes**
- largest glaciers complexes > 10,000 km<sup>2</sup>
- largest glaciers are one order of magnitude smaller
- separation of glaciers is a remaining key challenge

And which glaciers are the largest in Europe?  
Alaska? Andes? Asia? Africa?

Windnagel et al. (2022, J. Glaciology, in review):  
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