

ID: W2916928244

TITLE: Antarctic icebergs distributions 1992?2014

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ABSTRACT:

Abstract Basal melting of floating ice shelves and iceberg calving constitute the two almost equal paths of freshwater flux between the Antarctic ice cap and the Southern Ocean. The largest icebergs ($>100 \text{ km}^2$) transport most of the ice volume but their basal melting is small compared to their breaking into smaller icebergs that constitute thus the major vector of freshwater. The archives of nine altimeters have been processed to create a database of small icebergs ($<8 \text{ km}^2$) within open water containing the positions, sizes, and volumes spanning the 1992?2014 period. The intercalibrated monthly ice volumes from the different altimeters have been merged in a homogeneous 23 year climatology. The iceberg size distribution, covering the $0.1\text{--}10,000 \text{ km}^2$ range, estimated by combining small and large icebergs size measurements follows well a power law of slope -1.52 ± 0.32 close to the $-3/2$ laws observed and modeled for brittle fragmentation. The global volume of ice and its distribution between the ocean basins present a very strong interannual variability only partially explained by the number of large icebergs. Indeed, vast zones of the Southern Ocean free of large icebergs are largely populated by small iceberg drifting over thousands of kilometers. The correlation between the global small and large icebergs volumes shows that small icebergs are mainly generated by large ones breaking. Drifting and trapping by sea ice can transport small icebergs for long period and distances. Small icebergs act as an ice diffuse process along large icebergs trajectories while sea ice trapping acts as a buffer delaying melting.

SOURCE: Journal of geophysical research. Oceans

PDF URL: <https://agupubs.onlinelibrary.wiley.com/doi/pdfdirect/10.1002/2015JC011178>

CITED BY COUNT: 96

PUBLICATION YEAR: 2016

TYPE: article

CONCEPTS: ['Iceberg', 'Geology', 'Altimeter', 'Ice shelf', 'Sea ice', 'Oceanography', 'Glacier', 'Cryosphere', 'Geomorphology', 'Geodesy']