



HAL
open science

New Late Glacial and Holocene ^{36}Cl and ^{10}Be moraine chronologies from sub-Antarctic Kerguelen Archipelago

Joanna Charton, Vincent Jomelli, Irene Schimmelpfennig, Deborah Verfaillie, Vincent Favier, Guillaume Delpech, Regis Braucher, Pierre-Henri Blard, V.R. Rinterknecht, Léo Chassiot, et al.

► To cite this version:

Joanna Charton, Vincent Jomelli, Irene Schimmelpfennig, Deborah Verfaillie, Vincent Favier, et al.. New Late Glacial and Holocene ^{36}Cl and ^{10}Be moraine chronologies from sub-Antarctic Kerguelen Archipelago. EGU General Assembly 2021, Apr 2021, Vienna (online), France. 10.5194/egusphere-egu21-9883 . hal-03419239

HAL Id: hal-03419239

<https://hal.science/hal-03419239>

Submitted on 8 Nov 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

EGU21-9883

<https://doi.org/10.5194/egusphere-egu21-9883>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



New Late Glacial and Holocene ^{36}Cl and ^{10}Be moraine chronologies from sub-Antarctic Kerguelen Archipelago

Joanna Charton¹, Vincent Jomelli¹, Irene Schimmelpfennig¹, Deborah Verfaillie², Vincent Favier³, Guillaume Delpech⁴, Régis Braucher¹, Pierre-Henri Blard⁵, Vincent Rinterknecht¹, Léo Chassiot⁶, Georges Aumaître^{1,7}, Didier L. Bourlès^{1,7}, and Karim Keddadouche^{1,7}

¹Aix Marseille Univ., CNRS, IRD, INRAE, Coll France, UM 34 CEREGE, Aix-en-Provence, France

²Earth and Life Institute, Université catholique de Louvain, Louvain-la-Neuve, Belgique

³Université Grenoble Alpes, IGE, CNRS, Grenoble, France

⁴Université Paris-Saclay, CNRS, GEOPS, 91405 Orsay, France

⁵Université de Lorraine, CNRS, CRPG, Vandœuvre-lès-Nancy, France

⁶Université Laval, Département de Géographie, CEN, Québec, QC, Canada

⁷ASTER Team

The Kerguelen Archipelago (49°S, 69°E) is an excellent location for the study of multi-millennial glacier fluctuations, since it is the largest still glaciated emerged area (552 km² in 2001) in the sub-Antarctic sector of the Indian Ocean, where many glacio-geomorphological formations such as moraines may be dated. To investigate the so-far little-known Late Glacial and the Holocene glacier fluctuations in Kerguelen, we apply cosmogenic nuclide dating of moraines in 3 glacial valleys: Val Travers valley, Ampere glacier valley and Arago glacier valley. We use in situ ^{36}Cl dating of the basaltic moraine boulders at the first two sites, and ^{10}Be dating of the quartz-bearing syenite boulders at the third site. The new ^{36}Cl and ^{10}Be exposure ages provide time constraints over the last 17,000 years. A glacial advance was highlighted during the Late Glacial at 14.4 ± 1.4 ka ago, probably linked to the Antarctic Cold Reversal event. These results are consistent with those previously obtained on the archipelago (Jomelli et al., 2017, 2018; Charton et al., 2020) and more generally those from other the sub-Antarctic regions (e.g. Sagredo et al., 2018). This suggests that all glaciers at this latitude were broadly sensitive to this specific climatic signal. No Early nor Mid Holocene advances were evidenced in Kerguelen glacier evolution during the Holocene due to missing moraines that may have formed in these specific periods. Radiocarbon-dated peat, published in the 1990s, provides evidence of less extensive glacier extents during the Early Holocene than during the Late Holocene (Frenot et al., 1997). Finally, glaciers seem to have re-advanced only during the Late Holocene, especially within the last millennium, at ≈ 1 ka, ≈ 620 years and ≈ 390 years (Verfaillie et al., submitted). A comparison of this new dataset with the available ^{10}Be ages from other sub-Antarctic regions allows for the identification of 3 different glacier evolution patterns during the Holocene. The glacial fluctuations experienced by Kerguelen glaciers seems particularly uncommon, and are likely due to its singular location in the Southern Indian Ocean. Finally, climatic factors that may explain the Kerguelen glacier evolution (temperature, precipitation) are discussed. To this end, we investigate the chronology of glacier advance/retreat

periods with *(i)* the variation in atmospheric temperatures recorded in ice cores in Antarctica and *(ii)* the variation in precipitation (Southern Westerly Winds, Southern Annular Mode).

Charton et al., 2020 : Ant. Sci. 1-13

Frenot et al., 1997 : C.R. Acad. Sci. Paris Life Sciences 320, 567-573

Jomelli et al., 2017 : Quat. Sci. Rev. 162, 128-144

Jomelli et al., 2018 : Quat. Sci. Rev. 183, 110-123

Sagredo et al., 2018 : Quat Sci. Rev. 188, 160-166

Verfaillie et al., submitted