

References

The numbers within curly brackets at the end of each entry denote the pages in which that reference has been cited.

- Alley, R. B. (1987). Firn densification by grain boundary sliding: A first model. *Journal de Physique Colloques (Paris)*, 48(C1, Suppl. 3), 249–256. {22}
- Alley, R. B. (1988). Fabrics in polar ice sheets: Development and prediction. *Science*, 240, 493–495. {67}
- Alley, R. B. (1992). Flow-law hypothesis for ice-sheet modelling. *Journal of Glaciology*, 38, 245–256. {67, 68}
- Alley, R. B., Bolzan, J. F., & Whillans, I. M. (1982). Polar firn densification and grain growth. *Annals of Glaciology*, 3, 7–11. {21}
- Alley, R. B., Gow, A. J., & Meese, D. A. (1995). Mapping c-axis fabrics to study physical processes in ice. *Journal of Glaciology*, 41(137), 197–203. {67, 68}
- Alley, R. B., Gow, A. J., Meese, D. A., Fitzpatrick, J. J., Waddington, E. D., & Bolzan, J. F. (1997). Grain-scale processes, folding, and stratigraphic disturbance in the Greenland Ice Sheet Project 2 ice core. *Journal of Geophysical Research*, 102, 26819–26830. {17, 59}
- Alley, R. B., Perepezko, J. H., & Bentley, C. R. (1986a). Grain growth in polar ice: I. Theory. *Journal of Glaciology*, 32(112), 415–424. {68, 69}
- Alley, R. B., Perepezko, J. H., & Bentley, C. R. (1986b). Grain growth in polar ice: II. Application. *Journal of Glaciology*, 32(112), 425–433. {68}
- Ams, J., Brehme, A., Janneck, J., Kaiser, W., Lensch, N., Porgarzalek, J., et al. (2001). Dismantling of the Filchner Station. In E. Fahrbach & S. E. Naggar (Eds.), *The Expeditions ANTARKTIS XVI/1-2 of the Research Vessel POLARSTERN in 1998/1999*. no. 380 in Reports on Polar and Marine Research (Ber. Polarforsch. Meeresforsch., pp. 126–131). Bremerhaven: Alfred Wegener Institute for Polar and Marine Research. {45}
- Anderson, D. L., & Benson, C. S. (1963). The densification and diagenesis of snow. In W. D. Kingery (Ed.), *Ice and Snow* (pp. 391–411). Cambridge, MA: MIT Press. {22}
- Arnaud, L., Barnola, J. M., & Duval, P. (2000). Physical modeling of the densification of snow/ firn and ice in the upper part of polar ice sheets. In T. Hondoh (Ed.), *Physics of Ice Core Records* (pp. 285–305). Sapporo: Hokkaido University Press. {22}
- Arnaud, L., Gay, M., Barnola, J. M., & Duval, P. (1998). Imaging of firn and bubbly ice in coaxial reflected light: A new technique for the characterization of these porous media. *Journal of Glaciology*, 44(147), 326–332. {63}
- Athern, R. J., Vaughan, D. G., Rankin, A. M., Mulvaney, R., & Thomas, E. R. (2010). In situ measurements of Antarctic snow compaction compared with predictions of models. *Journal of Geophysical Research*, 115(F3): F03011/1–12. {22}
- Azuma, N., & Goto-Azuma, K. (1996). An anisotropic flow law for ice-sheet ice and its implications. *Annals of Glaciology*, 23, 202–208. {59, 68}
- Azuma, N., Miyakoshi, T., Yokoyama, S., & Takata, M. (2012). Impeding effect of air bubbles on normal grain growth of ice. *Journal of Structural Geology*, 42, 184–193. {69}
- Bader, H. (1962) Scope, problems, and potential value of deep core drilling in ice sheets. Special Report 58, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. {30}
- Bamber, J. L., Alley, R. B., & Joughin, I. (2007). Rapid response of modern day ice sheets to external forcing. *Earth and Planetary Science Letters*, 257, 1–13. {16}
- Bamber, J. L., & Bindschadler, R. A. (1997). An improved elevation dataset for climate and ice-sheet modelling: Validation with satellite imagery. *Annals of Glaciology*, 25, 439–444. {38}
- Bamber, J. L., Vaughan, D. G., & Joughin, I. (2000). Widespread complex flow in the interior of the Antarctic ice sheet. *Science*, 287, 1248–1250. {16}
- Barbante, C., Fischer, H., Masson-Delmotte, V., Waelbroeck, C., & Wolff, E. W. (2010). Climate of the last million years: New insights from EPICA and other records. *Quaternary Science Reviews*, 29(1), 1–7. {35}
- Barnes, P. R. F., & Wolff, E. W. (2004). Distribution of soluble impurities in cold glacial ice. *Journal of Glaciology*, 50(170), 311–324. {59}
- Barnes, P. R. F., Wolff, E. W., Mader, H. M., Udisti, R., Castellano, E., & Röhlisberger, R. (2003). Evolution of chemical peak shapes in the Dome C, Antarctica, ice core. *Journal of Geophysical Research*, 108(D3): 4126/1–14. {59}
- Barnola, J. M., Pimienta, P., Raynaud, D., & Korotkevich, Y. S. (1991). CO₂ climate relationship as deduced from the Vostok ice core: A re-examination based on new measurements and on a re-evaluation of the air dating. *Tellus B*, 43(2), 83–90. {22}
- Barnola, J. M., Raynaud, D., Korotkevich, Y. S., & Lorius, C. (1987). Vostok ice core provides 160,000-year record of atmospheric carbon dioxide. *Nature*, 339, 738–743. {24}
- Baschin, O. (1929). Entdeckungsflüge im Südpolargebiet. *Naturwissenschaften*, 17(13), 215–217. {37}
- Baschin, O. (1931). Die Südpolarforschung im Sommer 1929–1930. *Naturwissenschaften*, 19(16), 333–341. {37}
- Beck, P. A., & Sperry, P. R. (1950). Strain induced grain boundary migration in high purity aluminum. *Journal of Applied Physics*, 21, 150–152. {10}
- Bendel, V., Ueltzhöffer, K. J., Freitag, J., Kipfstuhl, S., Kuhs, W. F., Garbe, C. S., et al. (2013). High-resolution variations in size, number,

- and arrangement of air bubbles in the EPICA DML ice core. *Journal of Glaciology*, 59(217), 972–980. {23, 25, 57, 75, 79}
- Bender, M. L. (2002). Orbital tuning chronology for the Vostok climate record supported by trapped gas composition. *Earth and Planetary Science Letters*, 204, 275–289. {24, 27}
- Bender, M. L., Sowers, T., Barnola, J. M., & Chappellaz, J. (1994). Changes in the O₂-N₂ ratio of the atmosphere during recent decades reflected in the composition of air in the firn at Vostok station, Antarctica. *Geophysical Research Letters*, 21, 189–192. {21}
- Birnbaum, G., Freitag, J., Brauner, R., König-Langlo, G., Fischer, E., Kipfstuhl, S., et al. (2010). Strong-wind events and their influence on the formation of snow dunes: Observations from Kohnen Station, Dronning Maud Land. *Journal of Glaciology*, 5(199), 891–902. {19}
- Bond, G., Broecker, W., Johnsen, S., McManus, J., Labeyrie, L., Jouzel, J., et al. (1993). Correlations between climate records from North Atlantic sediment and Greenland ice. *Nature*, 365, 143–147. {31}
- Bond, G., Heinrich, H., Broecker, W., Labeyrie, L., McManus, J., Andrews, J., et al. (1992). Evidence for massive discharges of icebergs into the North Atlantic ocean during the last glacial period. *Nature*, 360, 245–249. {16}
- Budd, W. F., & Warner, R. C. (1996). A computer scheme for rapid calculations of balance-flux distributions. *Annals of Glaciology*, 23, 21–27. {45}
- Byrd, R. E. (1930). The conquest of Antarctica by air. *National Geographic Magazine*, 58(2), 127–227. {37}
- Cahn, R. W. (1970). Recovery and recrystallization. In R. W. Cahn (Ed.), *Physical Metallurgy* (pp. 1129–1197). Amsterdam: North-Holland. {7}
- Calov, R., Savvin, A., Greve, R., Hansen, I., & Hutter, K. (1998). Simulation of the Antarctic ice sheet with a three-dimensional polythermal ice-sheet model, in support of the EPICA project. *Annals of Glaciology*, 27, 201–206. {39}
- Cogley, J. G., Hock, R., Rasmussen, L. A., Arendt, A. A., Bauder, A., Braithwaite, et al. (2011). Glossary of glacier mass balance and related terms. IHP-VII Technical Documents in Hydrology 86, UNESCO-IHP, Paris. IACS Contribution No. 2. {4}
- Colbeck, S. C. (1983). Theory of metamorphism of dry snow. *Journal of Geophysical Research*, 88(C9), 5475–5482. {19, 21}
- Colbeck, S. C. (1989). Air movement in snow due to windpumping. *Journal of Glaciology*, 35(120), 209–213. {21}
- Cuffey, K. M. (2008). A matter of firn. *Science*, 320, 1596–1597. {25}
- Cuffey, K. M., & Steig, E. J. (1998). Isotopic diffusion in polar firn: Implications for interpretation of seasonal climate parameters in ice-core records, with emphasis on central Greenland. *Journal of Glaciology*, 44, 273–284. {19}
- Dahl-Jensen, D. & Gundestrup, N.S. (1987) Constitutive properties of ice at Dye 3, Greenland. In: *IAHS Red Book 170, The Physical Basis of Ice Sheet Modelling*, pp. 31–43. International Association of Hydrological Sciences. {9}
- Dansgaard, W., Johnsen, S. J., Clausen, H. B., Dahl-Jensen, D., Gundestrup, N. S., Hammer, C. U., et al. (1993). Evidence for general instability of past climate from a 250-kyr ice-core record. *Nature*, 364, 218–220. {31}
- Davis, R., Arons, E., & Albert, M. (1996). Metamorphism of polar firn: Significance of microstructure in energy, mass and chemical species transfer. *Chemical Exchange Between the Atmosphere and Polar Snow, NATO ASI Series*, 143, 379–401. {19}
- De Angelis, H., & Kleman, J. (2007). Palaeo-ice streams in the Foye/Baffin sector of the Laurentide Ice Sheet. *Quaternary Science Reviews*, 26, 1313–1331. {16}
- De la Chapelle, S., Castelnau, O., Lipenkov, V., & Duval, P. (1998). Dynamic recrystallization and texture development in ice as revealed by the study of deep ice cores in Antarctica and Greenland. *Journal of Geophysical Research*, 103, 5091–5105. {67, 68, 69}
- Descartes, R. (1637). Les météores. In: *Discours de la Méthode*, pp. 223–233. Ian Maire, Leyden. {3}
- Descartes, R. (1644). *Principia Philosophiae*. Amsterdam: Elsevier. {3}
- Dominé, F., & Shepson, P. B. (2002). Air-snow interactions and atmospheric chemistry. *Science*, 297, 1506–1510. {19}
- Drücker, C., Wilhelms, F., Oerter, H., Frenzel, A., Gernandt, H., & Miller, H. (2002). Design, transport, construction, and operation of the summer base Kohnen for ice-core drilling in Dronning Maud Land, Antarctica. *Memoirs of National Institute of Polar Research. Special issue*, 56, 302–312. {39}
- Drury, M. R., & Urai, J. L. (1990). Deformation-related recrystallization processes. *Tectonophysics*, 172, 235–253. {6}
- Durand, G., Weiss, J., Lipenkov, V., Barnola, J. M., Krinner, G., Parrenin, F., et al. (2006). Effect of impurities on grain growth in cold ice sheets. *Journal of Geophysical Research*, 111, F01015. {68, 77}
- Duval, P., Ashby, M. F., & Anderman, I. (1983). Rate-controlling processes in the creep of polycrystalline ice. *Journal of Physical Chemistry*, 87, 4066–4074. {67}
- Duval, P. & Castelnau, O. (1995). Dynamic recrystallization of ice in polar ice sheets. *Journal de Physique IV (Paris), Colloque C3*, 5: 197–205. {68}
- Duval, P., & Montagnat, M. (2002). Comment on “Superplastic deformation of ice: Experimental observations” by D. L. Goldsby and D. L. Kohlstedt. *Journal of Geophysical Research*, 107(B4), 2082. {68}
- Eisen, O., Hamann, I., Kipfstuhl, S., Steinhage, D., & Wilhelms, F. (2007). Direct evidence for radar reflector originating from changes in crystal-orientation fabric. *The Cryosphere*, 1(1), 1–10. {79}
- Eliot, T. S. (1960). *The Family Reunion*. London: Faber and Faber. {57}
- EPICA Community Members. (2004). Eight glacial cycles from an Antarctic ice core. *Nature*, 429(6992), 623–628. {16, 33, 35}
- EPICA Community Members. (2006). One-to-one coupling of glacial climate variability in Greenland and Antarctica. *Nature*, 444(7116), 195–197. {16, 34, 35, 67}
- Etheridge, D. M. (1989). Dynamics of the Law Dome ice cap, Antarctica, as found from bore-hole measurements. *Annals of Glaciology*, 12, 46–50.
- Faria, S. H. (2006). Creep and recrystallization of large polycrystalline masses. Part III: continuum theory of ice sheets. *Proceedings of the Royal Society of London A*, 462(2073), 2797–2816. {60}
- Faria, S. H. (2009). The multidisciplinary ice core. *Low Temperature Science*, 68, 35–37. {IX}
- Faria, S. H., Freitag, J., & Kipfstuhl, S. (2010). Polar ice structure and the integrity of ice-core paleoclimate records. *Quaternary Science Reviews*, 29(1), 338–351. {16, 17, 26, 34, 59, 63, 69, 70, 75, 76, 77, 78, 79, 80, 81}
- Faria, S. H., Hamann, I., Kipfstuhl, S., & Miller, H. (2006). Is Antarctica like a birthday cake? Preprint 33/2006. Max Planck Institute for Mathematics in the Sciences, Leipzig. {77, 81}
- Faria, S. H., & Kipfstuhl, S. (2004). Preferred slip band orientations and bending observed in the Dome Concordia (East Antarctica) ice core. *Annals of Glaciology*, 39, 386–390. {63}
- Faria, S. H., Kipfstuhl, S., Azuma, N., Freitag, J., Hamann, I., Mursheed, M. M., et al. (2009). The multiscale structure of Antarctica. Part I: inland ice. *Low Temperature Science*, 68, 39–59. {4, 17, 26, 59, 62, 69, 70, 77, 78, 81}
- Faria, S. H., Kvitarev, D., & Hutter, K. (2002). Modelling evolution of anisotropy in fabric and texture of polar ice. *Annals of Glaciology*, 35, 545–551. {68}
- Faria, S. H., Weikusat, I., & Azuma, N. (2014a). The microstructure of polar ice. Part I: highlights from ice core research. *Journal of Structural Geology*, 61, 2–20. {16, 29, 59, 67, 76, 77}
- Faria, S. H., Weikusat, I., & Azuma, N. (2014b). The microstructure of polar ice. Part II: state of the art. *Journal of Structural Geology*, 61, 21–49. {4, 17, 24, 34, 58, 59, 60, 62, 63, 65, 67, 70, 77, 78, 81}
- Fischer, H., Fundel, F., Ruth, U., Twarloh, B., Wegner, A., Udisti, R. et al. (2007a). Reconstruction of millennial changes in dust emission, transport and regional sea ice coverage using the deep EPICA ice

- cores from the Atlantic and Indian Ocean sector of Antarctica. *Earth and Planetary Science Letters*, 260(1–2), 340–354. {67}
- Fischer, H., Siggaard-Andersen, M. L., Ruth, U., Roethlisberger, R. & Wolff, E. (2007b). Glacial/interglacial changes in mineral dust and sea-salt records in polar ice cores: Sources, transport, and deposition. *Reviews of Geophysics*, 45(1): RG1002/1–26. {19}
- Fischer, H., Wagenbach, D., & Kipfstuhl, S. (1998). Sulfate and nitrate firm concentrations on the Greenland Ice Sheet 1: Large-scale geographical deposition changes. *Journal of Geophysical Research*, 103(D17), 21927–21934. {19}
- Freitag, J., Kipfstuhl, S., & Faria, S. H. (2008). The connectivity of crystallite agglomerates in low density firm at Kohlen station, Dronning Maud Land, Antarctica. *Annals of Glaciology*, 49, 114–120. {59}
- Freitag, J., Kipfstuhl, S., Laepple, T., & Wilhelms, F. (2013). Impurity-controlled densification: A new model for stratified polar firm. *Journal of Glaciology*, 59(218), 1163–1169. {22, 25}
- Freitag, J., Wilhelms, F., & Kipfstuhl, S. (2004). Microstructure-dependent densification of polar firm derived from X-ray microtomography. *Journal of Glaciology*, 50, 243–250. {24}
- Frezzotti, M., Gandolfi, S. & Urbini, S. (2002). Snow megadunes in Antarctica: Sedimentary structure and genesis. *Journal of Geophysical Research*, 107(D18). Art. No. 4344. {19}
- Frost, H. J., & Ashby, M. F. (1982). *Deformation-mechanism Maps*. Oxford: Pergamon. {15}
- Fujita, S., Okuyama, J., Hori, A., & Hondoh, T. (2009). Metamorphism of stratified firm at Dome Fuji, Antarctica: A mechanism for local insolation modulation of gas transport conditions during bubble close off. *Journal of Geophysical Research*, 114(F3), F03023. {27}
- Garfield, D. E., & Ueda, H. T. (1976). Resurvey of the “Byrd” Station, Antarctica, drill hole. *Journal of Glaciology*, 17(75), 29–34. {9}
- Gerland, S., Oerter, H., Kipfstuhl, J., Wilhelms, F., Miller, H., & Miners, W. D. (1999). Density log of a 181m long ice core from Berkner Island, Antarctica. *Annals of Glaciology*, 29, 215–219. {24}
- Gödert, G., & Hutter, K. (1998). Induced anisotropy in large ice sheets: Theory and its homogenization. *Continuum Mechanics and Thermodynamics*, 13, 91–120. {68}
- Goujon, C., Barnola, J. M. & Ritz, C. (2003). Modeling the densification of polar firm including heat diffusion: Application to close-off characteristics and gas isotopic fractionation for Antarctica and Greenland sites. *Journal of Geophysical Research*, 108(D24): 4792/1–18. {22}
- Gow, A. J. (1969). On the rates of growth of grains and crystals in south polar firm. *Journal of Glaciology*, 8(53), 241–252. {67, 68, 69}
- Gow, A. J. (1971). Relaxation of ice in deep drill cores from Antarctica. *Journal of Glaciology*, 76, 2533–2541. {27, 28}
- Gow, A. J., & Meese, D. (2007a). The distribution and timing of tephra deposition at Siple Dome, Antarctica: Possible climatic and rheologic implications. *Journal of Glaciology*, 53(183), 585–596. {16}
- Gow, A. J., & Meese, D. (2007b). Physical properties, crystalline textures and c-axis fabrics of the Siple dome (Antarctica) ice core. *Journal of Glaciology*, 53(183), 573–584. {17}
- Gow, A. J., & Williamson, T. (1975). Gas inclusions in the Antarctic ice sheet and their glaciological significance. *Journal of Geophysical Research*, 80(36), 5101–5108. {27}
- Gow, A. J., & Williamson, T. (1976). Rheological implications of the internal structure and crystal fabrics of the West Antarctic ice sheet as revealed by deep core drilling at Byrd Station. *Geological Society of America Bulletin*, 87, 1665–1677. {16, 76, 77}
- Grannas, A. M., et al. (2007). An overview of snow photochemistry: Evidence, mechanisms and impacts. *Atmospheric Chemistry and Physics*, 7, 4165–4283. {19}
- Gundestrup, N. S., & Hansen, B. L. (1984). Bore-hole survey at Dye 3, south Greenland. *Journal of Glaciology*, 30, 282–288. {9}
- Helsen, M. M., van den Broeke, M. R., van de Wal, R. S. W., van de Berg, W. J., van Meijgaard, E., Davis, C. H., et al. (2008). Elevation changes in Antarctica mainly determined by accumulation variability. *Science*, 320, 1626–1629. {25}
- Hemming, S. R. (2004). Massive late Pleistocene detritus layers of the North Atlantic and their global climate imprints. *Reviews of Geophysics*, 42(1): pRG1005. {16}
- Herron, M. M., & Langway, C. C, Jr. (1980). Firm densification: An empirical model. *Journal of Glaciology*, 25(93), 373–385. {22}
- Hobbs, P. V. (1974). *Ice Physics*. Oxford: Clarendon. {63}
- Hörhold, M. W., Kipfstuhl, S., Wilhelms, F., Freitag, J. & Frenzel, A. (2011). The densification of layered polar firm. *Journal of Geophysical Research*, 116(F1): F01001/1–15. {24}
- Hörhold, M. W., Laepple, T., Freitag, J., Bigler, M., Fischer, H., & Kipfstuhl, S. (2012). On the impact of impurities on the densification of polar firm. *Earth and Planetary Science Letters*, 325–326, 93–99. {24, 25}
- Hori, A., Tayuki, K., Narita, H., Hondoh, T., Fujita, S., Kameda, T., et al. (1999). A detailed density profile of the Dome Fuji (Antarctica) shallow ice core by X-ray transmission method. *Annals of Glaciology*, 29, 211–214. {24}
- Humphreys, F. J. & Hatherly, M. (2004). *Recrystallization and Related Annealing Phenomena* (2nd edn). Oxford: Pergamon. {7, 9, 10, 69}
- Huybrechts, P., Steinhage, D., Wilhelms, F., & Bamber, J. (2000). Balance velocities and measured properties of the Antarctic ice sheet from a new compilation of gridded data for modelling. *Annals of Glaciology*, 30, 52–60. {38, 39}
- Hvidberg, C. S., Steffensen, J. P., Clausen, H. B., Shoji, H., & Kipfstuhl, J. (2002). The NorthGRIP ice-core logging procedure: description and evaluation. *Annals of Glaciology*, 35, 5–8. {9}
- Ikeda, T., Fukazawa, H., Mae, S., Pepin, L., Duval, P., Champagnon, B., et al. (1999). Extreme fractionation of gases caused by formation of clathrate hydrates in Vostok Antarctic ice. *Geophysical Research Letters*, 26(1), 91–94. {26}
- Ikeda-Fukazawa, T., Fukumizu, K., Kawamura, K., Aoki, S., Nakazawa, T., & Hondoh, T. (2005). Effects of molecular diffusion on trapped gas composition in polar ice cores. *Earth and Planetary Science Letters*, 229, 183–192. {27}
- Ikeda-Fukazawa, T., Hondoh, T., Fukumura, T., Fukazawa, H., & Mae, S. (2001). Variation in N₂/O₂ ratio of occluded air in Dome Fuji antarctic ice. *Journal of Geophysical Research*, 106(D16), 17799–17810. {27}
- Iliescu, D., Baker, I., & Chang, H. (2004). Determining the orientations of ice crystals using electron backscatter patterns. *Microscopy Research and Technique*, 63, 183–187. {59, 67}
- Jansen, D., Sandhäger, H. & Rack, W. (2005a) Evolution of tabular iceberg A-38B, observation and simulation. FRISP Report 16, Forum for Research into Ice Shelf Processes. {45}
- Jansen, D., Sandhäger, H., & Rack, W. (2005b). Model experiments on large tabular iceberg evolution: ablation and strain thinning. *Journal of Glaciology*, 51(174), 363–372. {45}
- Johnsen, S., Hansen, S. B., Sheldon, S. G., Dahl-Jensen, D., Steffensen, J. P., Augustin, L., et al. (2007). The Hans Tausen drill: design, performance, further developments and some lessons learned. *Annals of Glaciology*, 47, 89–98. {48, 53}
- Johnsen, S. J., Clausen, H. B., Cuffey, K. M., Hoffmann, G., Schwander, J., & Creyts, T. (2000). Diffusion of stable isotopes in polar firm and ice: the isotope effect in firm diffusion. In T. Hondoh (Ed.), *Physics of Ice Core Records* (pp. 121–140). Sapporo: Hokkaido University Press. {59}
- Johnsen, S. J., Clausen, H. B., Dansgaard, W., Fuhrer, K., Gundestrup, N. S., Hammer, C. U., et al. (1992). Irregular glacial interstadials recorded in a new greenland ice core. *Nature*, 359, 311–313. {31}
- Jouzel, J., Barkov, N. I., Barnola, J. M., Bender, M., Chappellaz, J., Genthon, C., et al. (1993). Extending the Vostok ice-core record of paleoclimate to the penultimate glacial period. *Nature*, 364, 407–412. {31}
- Jouzel, J., Masson-Delmotte, V., Cattani, O., Dreyfus, G., Falourd, S., Hoffmann, G., et al. (2007). Orbital and millennial Antarctic climate

- variability over the past 800,000 years. *Science*, 317(5839), 793–797. {33, 34}
- Kaufmann, P., Fundel, F., Fischer, H., Bigler, M., Ruth, U., Udisti, et al. (2010). Ammonium and non-sea salt sulfate in the EPICA ice cores as indicator of biological activity in the Southern Ocean. *Quaternary Science Reviews*, 29(1–2), 313–323. {67}
- Kepler, J. (1611). *Strena seu de nive sexangula*. Gottfried Tambach, Frankfurt. {3}
- Kepler, J. (1619). *Harmonices Mundi*. Johann Planck (for Gottfried Tambach), Linz. {3}
- Kipfstuhl, S., Faria, S. H., Azuma, N., Freitag, J., Hamann, I., Kaufmann, P., et al. (2009). Evidence of dynamic recrystallization in polar firn. *Journal of Geophysical Research*, 114, B05204. {24, 58, 62, 63, 67, 69, 70, 78}
- Kipfstuhl, S., Hamann, I., Lambrecht, A., Freitag, J., Faria, S. H., Grigoriev, D., et al. (2006). Microstructure mapping: A new method for imaging deformation-induced microstructural features of ice on the grain scale. *Journal of Glaciology*, 52(178), 398–406. {62, 63, 67, 69, 70, 78}
- Kipfstuhl, S., Pauer, F., Kuhs, W. F., & Shoji, H. (2001). Air bubbles and clathrate hydrates in the transition zone of the NGRIP deep ice core. *Geophysical Research Letters*, 28, 591–594. {25, 26, 28}
- Kirchner, N. P., & Faria, S. H. (2009). The multiscale structure of Antarctica. Part II: ice shelves. *Low Temperature Science*, 68, 61–71. {8, 16}
- Kristensen, M. (1983). Iceberg calving and deterioration in Antarctica. *Progress in Physical Geography*, 7(3), 313–328. {16}
- Kütarev, D., Gödert, G. & Hutter, K. (2002). Cellular automaton model for recrystallization, fabric and texture development in polar ice. *Journal of Geophysical Research*, 107(B8), EPM 5–1–EPM 5–9. {68}
- Kuroiwa, D., & Hamilton, W. L. (1963). Studies of ice etching and dislocation etch pits. In W. D. Kingery (Ed.), *Ice and snow: Properties, processes, and applications* (pp. 34–55). Cambridge, MA: MIT Press. {63}
- Langway, Jr., C. C. (2008) The history of early polar ice cores. Technical Report ERDC/CRREL TR-08-1, U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH. {30}
- Legrand, M., & Mayewski, P. A. (1997). Glaciochemistry of polar ice cores: a review. *Reviews of Geophysics*, 35, 219–243. {25}
- Lemke, P., Ren, J., Alley, R. B., Allison, I., Carrasco, J., Flato, G., et al. (2007). Observations: changes in snow, ice and frozen ground. In S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, & H. L. Miller (Eds.), *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge: Cambridge University Press. {15}
- Lhomme, N., Clarke, G. K. C., & Marshall, S. J. (2005). Tracer transport in the Greenland Ice Sheet: Constraints on ice cores and glacial history. *Quaternary Science Reviews*, 24, 173–194. {17}
- Lipenkov, V. Y. (2000). Air bubbles and air-hydrate crystals in the Vostok ice core. In T. Hondoh (Ed.), *Physics of ice core records* (pp. 327–358). Sapporo: Hokkaido University Press. {75}
- Lipenkov, V. Y., Salamatin, A., & Duval, P. (1997). Bubbly-ice densification in ice sheets: II. Applications. *Journal of Glaciology*, 43, 397–407. {25}
- Lüthi, D., Bereiter, B., Stauffer, B., Winkler, R., Schwander, J., Kindler, P., et al. (2010). CO₂ and O₂/N₂ variations in and just below the bubble-clathrate transformation zone of Antarctic ice cores. *Earth and Planetary Science Letters*, 297, 226–233. {59, 75, 79}
- Maeno, N., & Ebinuma, T. (1983). Pressure sintering of ice and its implication to the densification of snow at polar glaciers and ice sheets. *Journal of Physical Chemistry*, 87(21), 4103–4110. {22, 24, 69}
- McConnell, J. R., Maselli, O. J., Sigl, M., Vallelonga, P., Neumann, T., Anshütz, H., et al. (2014). Antarctic-wide array of high-resolution ice core records reveals pervasive lead pollution began in 1889 and persists today. *Scientific Reports*, 4, 5848/1–5. {19}
- McGwire, K. C., Hargreaves, G. M., Alley, R. B., Popp, T. J., Reusch, D. B., Spencer, M. K., et al. (2008). An integrated system for optical imaging of ice cores. *Cold Regions Science and Technology*, 53, 216–228. {72}
- Miller, S. L. (1969). Clathrate hydrates of air in Antarctic ice. *Science*, 165, 489–490. {25}
- Miyamoto, A., Saito, T., & Hondoh, T. (2009). Visual observation of volume relaxation under different storage temperatures in the Dome Fuji ice core, Antarctica. *Low Temperature Science*, 68, 73–79. {27}
- Montagnat, M., Azuma, N., Dahl-Jensen, D., Eichler, J., Fujita, S., Gillet-Chaulet, F., et al. (2014). Fabric along the NEEM ice core, Greenland, and its comparison with GRIP and NGRIP ice cores. *The Cryosphere*, 8(4), 1129–1138. {61}
- Montagnat, M., & Duval, P. (2000). Rate controlling processes in the creep of polar ice, influence of grain boundary migration associated with recrystallization. *Earth and Planetary Science Letters*, 183, 179–186. {68}
- Mullins, W. W. (1957). Theory of thermal grooving. *Journal of Applied Physics*, 28(3), 333–339. {63}
- Nakahara, J., Shigesato, Y., Higashi, A., Hondoh, T., & Langway, C. C. (1988). Raman spectra of natural clathrates in deep ice cores. *Philosophical Magazine B*, 57(3), 421–430. {26}
- Narita, H., Azuma, N., Hondoh, T., Fujii, M., Kawaguchi, M., Mae, S., et al. (1999). Characteristics of air bubbles and hydrates in the Dome Fuji ice core, Antarctica. *Journal of Glaciology*, 29(1), 207–210. {26}
- Nedelcu, A. F., Faria, S. H., & Kuhs, W. F. (2009). Raman spectra of plate-like inclusions in the EPICA-DML (Antarctica) ice core. *Journal of Glaciology*, 55(189), 183–184. {27, 28}
- NEEM Community Members. (2013). Eemian interglacial reconstructed from a Greenland folded ice core. *Nature*, 493(7433), 489–494. {17, 59}
- Nishida, K., & Narita, H. (1996). Three-dimensional observations of ice crystal characteristics in polar ice sheets. *Journal of Geophysical Research*, 101(D16), 21311–21317. {63}
- Nordenskjöld, A. E. (1861). Beitrag zur Kenntnis der Krystallformen einiger Oxide. *Annual Review of Physical Chemistry*, 4(24): 612–627. Poggendorff's Ann. 114. {60}
- Obbard, R., & Baker, I. (2007). The microstructure of meteoric ice from Vostok, Antarctica. *Journal of Glaciology*, 53(180), 41–62. {59}
- Oerlemans, J. (2001). *Glaciers and climate change*. Lisse: A. A. Balkema. {16}
- Oerter, H., Drücker, C., Kipfstuhl, S., & Wilhelms, F. (2009). Kohlen Station, the drilling camp for the EPICA deep ice core in Dronning Maud Land. *Polarforschung*, 78(1/2), 1–23. {32, 33, 34, 38, 39, 47, 49}
- Ohno, H., Igarashi, M. & Hondoh, T. (2006). Characteristics of salt inclusions in polar ice from Dome Fuji, East Antarctica. *Geophysical Research Letters*, 33: L08501/1–5. {59}
- Ohno, H., Lipenkov, V. Y., & Hondoh, T. (2010). Formation of air clathrate hydrates in polar ice sheets: Heterogeneous nucleation induced by micro-inclusions. *Journal of Glaciology*, 56(199), 917–921. {75}
- Parrenin, F., Barnola, J. M., Beer, J., Blunier, T., Castellano, E., Chappellaz, J., et al. (2007). The EDC3 chronology for the EPICA Dome C ice core. *Climate of the Past*, 3, 485–497. {34}
- Paterson, W. S. B. (1991). Why ice-age ice is sometimes “soft”. *Cold Regions Science and Technology*, 20(1), 75–98. {17, 77}
- Paterson, W. S. B. (1994). *The physics of glaciers*, 3rd edn. Oxford: Pergamon. {9, 17, 31, 69, 77}
- Pauer, F., Kipfstuhl, S., & Kuhs, W. (1996). Raman spectroscopic study on the spatial distribution of nitrogen and oxygen in natural ice clathrates

- and their decomposition to air bubbles. *Geophysical Research Letters*, 2, 177–180. {26}
- Pauer, F., Kipfstuhl, S., Kuhs, W. F., & Shoji, H. (1999). Air clathrate crystals from the GRIP deep ice core, Greenland: A number, size, and shape distribution study. *Journal of Glaciology*, 45, 22–30. {28}
- Petit, J. R., Jouzel, J., Raynaud, D., Barkov, N. I., Barnola, J. M., Basile, I., et al. (1999). Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. *Nature*, 399, 429–436. {16, 31}
- Phillips, R. (2001). *Crystals, defects and microstructures*. Cambridge: Cambridge University Press. {15}
- Piazolo, S., Montagnat, M., & Blackford, J. R. (2008). Sub-structure characterization of experimentally and naturally deformed ice using cryo-EBSD. *Journal of Microscopy*, 230(3), 509–519. {67}
- Pimienta, P. & Duval, P. (1987) Rate controlling processes in the creep of polar glacier ice. *Journal de Physique (Paris)*, 48(C1, Suppl. 3): 243–248. {68}
- Poirier, J. P. (1985). *Creep of crystals*. Cambridge: Cambridge University Press. {10}
- Popper, K.R. (1994) *The Myth of the Framework*. Routledge, London. Edited by M.A. Notturmo. {3}
- Prior, D. J., Diebold, S., Obbard, R., Daghlian, C., Goldsby, D. L., Durham, W. B., et al. (2012). Insight into the phase transformations between ice Ih and ice II from electron backscatter diffraction data. *Scripta Materialia*, 66(2), 69–72. {67}
- Raynaud, D., Lipenkov, V., Lemieux, B., Duval, P., Loutre, M. F., & Lhomme, N. (2007). The local insolation signature of air content in Antarctic ice: a new step toward an absolute dating of ice records. *Earth and Planetary Science Letters*, 261, 337–349. {24}
- Rignot, E., Casassa, G., Gogieni, P., Krabill, W., Rivera, A., & Thomas, R. (2004). Accelerated ice discharge from the Antarctic Peninsula following the collapse of Larsen B ice shelf. *Geophysical Research Letters*, 31, L18401. {16}
- Roessiger, J., Bons, P. D., & Faria, S. H. (2014). Influence of bubbles on grain growth in ice. *Journal of Structural Geology*, 61, 123–132. {69}
- Roessiger, J., Bons, P. D., Griera, A., Jessell, M. W., Evans, L., Montagnat, M., et al. (2011). Competition between grain growth and grain-size reduction in polar ice. *Journal of Glaciology*, 57(205), 942–948. {69}
- Ruth, U., Barnola, J. M., Beer, J., Bigler, M., Blunier, T., Castellano, E., et al. (2007). “EDML1”: A chronology for the EPICA deep ice core from Dronning Maud Land, Antarctica, over the last 150 000 years. *Climate of the Past*, 3, 475–484. {34, 59, 78, 81}
- Ryser, C., Lüthi, M. P., Andrews, L. C., Hoffman, M. J., Catania, G. A., Hawley, R. L., et al. (2014). Sustained high basal motion of the Greenland ice sheet revealed by borehole deformation. *Journal of Glaciology*, 60(222), 647–660. {9}
- Sagan, C. (1997). *Billions and billions*. London: Headline. {15}
- Salamatin, A., Lipenkov, V. Y., & Duval, P. (1997). Bubbly-ice densification in ice sheets: I. Theory. *Journal of Glaciology*, 43, 387–396. {25}
- Salamatin, A. N., Lipenkov, V. Y., Barnola, J. M., Hori, A., Duval, P., & Hondoh, T. (2009). Snow/firn densification in polar ice sheets. *Low Temperature Science*, 68, 195–222. {22, 25}
- Salamatin, A. N., Lipenkov, V. Y., Ikeda-Fukazawa, T., & Hondoh, T. (2001). Kinetics of air-hydrate nucleation in polar ice sheets. *J. Cryst. Growth*, 223, 285–305. {25}
- Saylor, D. M., & Rohrer, G. S. (1999). Measuring the influence of grain-boundary misorientation on thermal groove geometry in ceramic polycrystals. *Journal of the American Ceramic Society*, 82, 1529–1536. {65}
- Schwander, J., & Stauffer, B. (1984). Age difference between polar ice and the air trapped in its bubbles. *Nature*, 311, 45–47. {24}
- Schytt, V. (1958). *Snow and ice studies in Antarctica*. Ph.D. thesis, University of Stockholm, Oslo. {29}
- Schytt, V. (1974). Obituary Hans W:son Ahlmann - 1889–1974. *Journal of Glaciology*, 13(69), 541–542. {29}
- Severinghaus, J. P., & Battle, M. O. (2006). Fractionation of gases in polar ice during bubble close-off: new constraints from firm air, Ne, Kr and Xe observations. *Earth and Planetary Science Letters*, 244(1–2), 474–500. {27}
- Shimada, W., & Hondoh, T. (2004). In situ observation of the transformation from air bubbles to air clathrate hydrate crystals using a Mizuho ice core. *Journal of Crystal Growth*, 265(1–2), 309–317. {75}
- Shoji, H., & Langway, C. C. Jr. (1982). Air hydrate inclusions in fresh ice core. *Nature*, 298, 548–550. {25, 26, 28}
- Shoji, H. & Langway, Jr., C.C. (1987) Microscopic observations of the air hydrate-bubble transformation process in glacier ice. *Journal de Physique (Paris)*, 48(C1, Suppl. 3): 141–148. {26}
- Siegenthaler, U., Monnin, E., Kawamura, K., Spahni, R., Schwander, J., Stauffer, B., et al. (2005). Supporting evidence from the EPICA Dronning Maud Land ice core for atmospheric CO₂ changes during the past millennium. *Tellus B*, 57(1), 51–57. {67}
- Siegert, M. J. (2001). *Ice sheets and late quaternary environmental change*. Chichester: Wiley. {16}
- Sloan, Jr., E. D. (1998). *Clathrate Hydrates of Natural Gases*, 2nd edn. New York: Marcel Dekker. {25}
- Smith, C. S. (1952). Grain shapes and other metallurgical applications of topology. In: *Metal Interfaces*, pp. 65–108. Cleveland, OH: American Society for Metals (ASM). {11}
- Smith, C. S. (1954). The microstructure of polycrystalline materials. *Transactions of Chalmers University of Technology*. Gothenburg: Chalmers University of Technology. {58}
- Staroszczyk, R., & Morland, L. W. (2001). Strengthening and weakening of induced anisotropy in polar ice. *Proceedings of the Royal Society of London. Series A*, 451(2014), 2419–2440. {68}
- Stauffer, B., Schwander, J., & Oeschger, H. (1985). Enclosure of air during metamorphosis of dry firn to ice. *Annals of Glaciology*, 6, 108–112. {24}
- Stauffer, B., & Tschumi, J. (2000). Reconstruction of past atmospheric CO₂ concentrations by ice core analyses. In T. Hondoh (Ed.), *Physics of ice core records* (pp. 217–241). Sapporo: Hokkaido University Press. {27}
- Steinhage, D. (2001) Contributions of geophysical measurements in Dronning Maud Land, Antarctica, locating an optimal drill site for a deep ice core drilling. Reports on polar and marine research (ber. polarforsch. meeresforsch.), Alfred Wegener Institute for Polar and Marine Research, Bremerhaven. {32, 34, 38, 39, 40, 41, 42, 43, 44, 45}
- Steinhage, D., Nixdorf, U., Meyer, U., & Miller, H. (1999). New maps of the ice thickness and subglacial topography in Dronning Maud Land, Antarctica, determined by means of airborne radio echo sounding. *Annals of Glaciology*, 29, 267–272. {38}
- Steinhage, D., Nixdorf, U., Meyer, U., & Miller, H. (2001). Subglacial topography and internal structure of central and western Dronning Maud Land, Antarctica, determined from airborne radio echo sounding. *Journal of Applied Physics*, 47, 183–189. {38}
- Stenni, B., Masson-Delmotte, V., Selmo, E., Oerter, H., Meyer, H., Roethlisberger, R., et al. (2010). The deuterium excess records of EPICA Dome C and Dronning Maud Land ice cores (East Antarctica). *Quaternary Science Reviews*, 29(1–2), 146–159. {67}
- Stephenson, P. J. (1967). Some considerations of snow metamorphism in the Antarctic ice sheet in the light of ice crystal studies. In: H. Oera (Ed.), *Physics of Snow and Ice*, vol. 1, Part 2, pp. 725–740. Sapporo: Hokkaido University Press. Proceedings of the International Conference on Low Temperature Science, 1966, Sapporo, Japan. {67, 68, 69}
- Suwa, M., & Bender, M. L. (2008). O₂/N₂ ratios of occluded air in the GISP2 ice core. *Journal of Geophysical Research*, 113(D11), D11119. {27}

- Svensson, A., Durand, G., Mathiesen, J., Persson, A., & Dahl-Jensen, D. (2009). Texture of the upper 1000 m in the GRIP and NorthGRIP ice cores. *Low Temperature Science*, 68, 107–113. {61}
- Svensson, A., Nielsen, S. W., Kipfstuhl, S., Johnsen, S. J., Steffensen, J. P., Bigler, M., et al. (2005). Visual stratigraphy of the North Greenland Ice Core Project (NorthGRIP) ice core during the last glacial period. *Journal of Geophysical Research*, 110, D02108. {72, 73}
- Takata, M., Iizuka, Y., Hondoh, T., Fujita, S., Fuji, Y., & Shoji, H. (2004). Stratigraphic analysis of Dome Fuji Antarctic ice core using an optical scanner. *Annals of Glaciology*, 39, 467–472. {72, 73}
- The Holy Bible. (2003). *Authorized (King James) Version*. Iowa Falls: World Bible Publishers. {37}
- Thomson, D. W. (1917). *On growth and form*. Cambridge: Cambridge University Press. {58}
- Thorsteinsson, T. (2002). Fabric development with nearest-neighbor interaction and dynamic recrystallization. *Journal of Geophysical Research*, 107(B1): ECV3–1–ECV3–13. {68}
- Thorsteinsson, T., Kipfstuhl, J., & Miller, H. (1997). Textures and fabrics in the GRIP ice core. *Journal of Geophysical Research*, 102, 26583–26599. {68}
- Thorsteinsson, T., & Waddington, E. D. (2002). Folding in strongly anisotropic layers near ice-sheet centers. *Annals of Glaciology*, 35, 480–486. {59}
- Uchida, T., Hondoh, T., Mae, S., Lipenkov, V. Y., & Duval, P. (1994a). Air-hydrate crystals in deep ice-core samples from Vostok Station, Antarctica. *Journal of Glaciology*, 40, 79–86. {26, 28}
- Uchida, T., Hondoh, T., Mae, S., Shoji, H., & Azuma, N. (1994b). Optimized storage condition of deep ice core samples from the viewpoint of air-hydrate analysis. *Memoirs of National Institute of Polar Research. Special issue*, 49, 306–313. {27}
- Uchida, T., Yasuda, K., Oto, Y., Shen, R., & Ohmura, R. (2014). Natural supersaturation conditions needed for nucleation of air-clathrate hydrates in deep ice sheets. *Journal of Glaciology*, 60(224), 1111–1116. {26}
- Ueda, H. T. & Garfield, D. E. (1968). Drilling through the Greenland ice sheet. Special Report 126, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. {30}
- Ueda, H. T. & Garfield, D. E. (1969) Core drilling through the Antarctic ice sheet. Technical Report 231, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. {30}
- Ueltzhöffer, K. J., Bendel, V., Freitag, J., Kipfstuhl, S., Wagenbach, D., Faria, S. H., et al. (2010). Distribution of air bubbles in the EDML and EDC ice cores from a new method of automatic image analysis. *Journal of Glaciology*, 56(196), 339–348. {23, 25, 57, 79}
- Van der Veen, C. J., & Whillans, I. M. (1994). Development of fabric in ice. *Cold Regions Science and Technology*, 22, 171–195. {68}
- Vaughan, D. G., Comiso, J. C., Allison, I., Carrasco, J., Kaser, G., Kwok, R., et al. (2013). Observations: Cryosphere. In T. F. Stocker, D. Qin, G. K. Plattner, M. Tignor, S. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, & P. Midgley (Eds.), *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge: Cambridge University Press. {15}
- Wang, Y., Kipfstuhl, S., Azuma, N., Thorsteinsson, T., & Miller, H. (2003). Ice-fabrics study in the upper 1500 m of the Dome C (East Antarctica) deep ice core. *Annals of Glaciology*, 37, 97–104. {59, 63}
- Watanabe, O., Jouzel, J., Johnsen, S., Parrenin, F., Shoji, H., & Yoshida, N. (2003). Homogeneous climate variability across East Antarctica over the past three glacial cycles. *Nature*, 422, 509–512. {16}
- Weikusat, C., Freitag, J., & Kipfstuhl, S. (2012). Raman spectroscopy of gaseous inclusions in EDML ice core: First results - microbubbles. *Journal of Glaciology*, 58(210), 761–766. {28}
- Weikusat, I., de Winter, D. A. M., Pennock, G. M., Hayles, M., Schneijdenberg, C. T. W. M., & Drury, M. R. (2011a). Cryogenic EBSD on ice: Preserving a stable surface in a low pressure SEM. *Journal of Microscopy*, 242(3), 295–310. {59, 67}
- Weikusat, I., Jansen, D., Binder, T., Eichler, J., Faria, S. H., Wilhelms, F., et al. (2017). Physical analysis of an Antarctic ice core—towards an integration of micro- and macrodynamics of polar ice. *Philosophical Transactions of the Royal Society A*, 375, 20150347. {9, 45, 61, 78}
- Weikusat, I., Kipfstuhl, S., Azuma, N., Faria, S. H., & Miyamoto, A. (2009a). Deformation microstructures in an Antarctic ice core (EDML) and in experimentally deformed artificial ice. *Low Temperature Science*, 68, 115–123. {69}
- Weikusat, I., Kipfstuhl, S., Faria, S. H., Azuma, N., & Miyamoto, A. (2009b). Subgrain boundaries and related microstructural features in EDML (Antarctica) deep ice core. *Journal of Glaciology*, 55(191), 461–472. {63, 65, 69, 70, 80}
- Weikusat, I., Miyamoto, A., Faria, S. H., Kipfstuhl, S., Azuma, N., & Hondoh, T. (2011b). Subgrain boundaries in Antarctic ice quantified by X-ray Laue diffraction. *Journal of Glaciology*, 57(201), 85–94. {59, 62, 63, 65, 69, 70}
- Wesche, C., Eisen, O., Oerter, H., Schulte, D., & Steinhage, D. (2007). Surface topography and ice flow in the vicinity of the EDML deep-drilling site. *Journal of Glaciology*, 53(182), 442–448. {39}
- West, R. D., Winebrenner, D. P., Tsang, L., & Rott, H. (1996). Microwave emission from density-stratified Antarctic firn at 6 cm wavelength. *Journal of Glaciology*, 42, 63–76. {19}
- Wilen, L. A., DiPrinzio, C. L., Alley, R. B., & Azuma, N. (2003). Development, principles, and applications of automated ice fabric analyzers. *Microscopy Research and Technique*, 62, 2–18. {59}
- Wilhelms, F., Miller, H., Gerasimoff, M. D., Drücker, C., Frenzel, A., Fritzsche, D., et al. (2014). The EPICA Dronning Maud Land deep drilling operation. *Journal of Glaciology*, 55(68), 355–366. {33}
- Wilson, C. J. L., & Peternell, M. (2011). Evaluating ice fabrics using fabric analyser techniques in Sørdsal Glacier, East Antarctica. *Journal of Glaciology*, 57(205), 881–894. {61}
- Wilson, C. J. L., Russell-Head, D. S., & Sim, H. M. (2003). The application of an automated fabric analyzer system to the textural evolution of folded ice layers in shear zones. *Annals of Glaciology*, 37, 7–17. {59}
- Wittgenstein, L. (1983). *Remarks on the Foundations of Mathematics*. Cambridge, MA: MIT Press. Edited by G. H. Wright R. Rhees and G. E. M. Anscombe. Translated to the English by G. E. M. Anscombe. {83}
- Zachos, J., Pagani, M., Sloan, L., Thomas, E., & Billups, K. (2001). Trends, rhythms and aberrations in global climate 65Ma to present. *Science*, 292(5517), 686–693. {16}

Subject Index

A

- a*-axis, 42
- Ablation, 3, 9, 11
- Accumulation. *See* snow accumulation
- Aerosol, 11
- AFA, 40–41
- Air
 - diffusive mixing. *See* air-snow interaction
 - firn interaction, 12–15
 - fractionation. *See* fractionation
 - hydrate. *See* clathrate hydrate
 - snow interaction, 11
- Altimetry, 11, 16, 23
- Antarctica, 4, 9, 14, 15, 18–20
 - Atlantic Sector, 20
 - bed, 19
 - ice
 - flow, 9
 - temperature. *See* ice temperature Antarctica
 - thickness, 9
 - volume, 9, 19
 - Indian Sector, 20
 - surface, 11
 - territorial claims, 23
- Antarctic Treaty, 19
- Arctic, 4, 15
- Atka Bay, 25, 28, 35
- Automatic Fabric Analysis. *See* AFA
- Axis
 - a*–. *See* *a*-axis
 - c*–. *See* *c*-axis
 - optic. *See* *c*-axis

B

- Bag number, 4, 57
- Band
 - bubble-free. *See* ice, bubble-free
 - cloudy. *See* cloudy band
 - kink. *See* kink band
 - slip. *See* slip band
- Basal ice, 55
- Basal slip, 6, 40

Bed, 19, 21

- temperature
 - EDML, 55
 - topography. *See* topography, bed
- BHT zone. *See* transition, bubble–hydrate
- Birefringence, 40, 42
- Borehole
 - casing, 28
 - constriction, 53
 - deformation, 4
 - depth. *See* depth, borehole
 - Dome Fuji, 25
 - EDML, 4, 24–28, 31–32, 36
 - pressure, 36
 - trench, 28, 32, 36
- Boundary
 - grain. *See* grain boundary
 - microshear, 5
 - subgrain. *See* subgrain boundary
 - tilt, 4, 6–7, 47
 - twist, 7
- Brick-wall pattern, 55
- Brittle zone. *See* ice, brittle
- Bubble, 13–14, 17, 43, 47, 49, 50, 54, 57, 58
 - age, 15
 - CO₂ enrichment. *See* fractionation
 - collective structure, 16, 48, 53, 58
 - free
 - band. *See* ice, bubble-free
 - ice. *See* ice, bubble-free
 - hydrate transition. *See* transition, bubble–hydrate
 - micro-. *See* microbubble
 - N₂-enrichment. *See* fractionation
 - pressure, 16, 53
 - size, 16, 48, 51, 53
- Bubbly ice. *See* ice, bubbly
- Burke–Turnbull–Hillert law, 46
- Byrd Station, 20

C

- Camp Century, 19
- Carbon dioxide, 16

c-axis, 40–42, 53–55
 CFA, 2, 38, 52
 Clathrate hydrate, 2, 16–18, 43, 45–47, 50–52
 CO₂ depletion. *See* fractionation
 dissociation pressure. *See* pressure, clathrate-hydrate dissociation
 nucleation, 51
 O₂ enrichment. *See* fractionation
 Climate
 change, 43, 51, 55
 cycle, 20, 22
 proxy. *See* proxy
 record, 9–10, 14, 16, 17, 19, 22, 39–40, 47, 52
 Cloudy band, 2, 10, 18, 51–55, 57, 58
 Complex system, 11
 Concordia Station, 20, 21
 Continuous Flow Analysis. *See* CFA
 Core-length depth. *See* depth, logged
 Creep, 2, 9, 13, 14, 40
 Coble. *See* creep, diffusion
 diffusion, 2
 dislocation, 2, 46
 Nabarro–Herring. *See* creep, diffusion
 Crossed polarizers. *See* polarizer
 Crystal
 growth, 2, 3
 lattice. *See* lattice, crystalline
 negative, 6, 7
 nucleation, 2, 5
 snow. *See* snow crystal
 Crystallite. *See* grain
 Crystallization, 2, 5
 Cutting plan EDML. *See* EPICA DML cutting plan

D

Dansgaard–Oeschger events, 19
 Dating of ice cores, 14–16, 21, 22, 35, 53, 55
 Defect. *See* lattice defect
 Deformation. *See* strain
 DEP, 2, 32, 33, 35, 52
 Depth
 borehole, 4
 core-length. *See* depth, logged
 logged, 4, 21, 32, 53, 57
 real, 4
 DGG. *See* grain growth, dynamic
 Dielectric Profile. *See* DEP
 Diffraction
 electron backscatter. *See* EBSD
 X-ray. *See* X-ray diffraction
 Diffusion
 creep. *See* creep diffusion
 molecular, 16–18
 Digital imaging, 39
 Dislocation, 2, 3, 6
 creep. *See* creep, dislocation
 wall, 2–3, 40, 41, 43, 46, 47, 49, 50
 DML, 2, 12, 14, 18, 23–25
 Dome F, 24
 Dome Fuji Station, 20, 24, 25
 Drill
 EDC, 21, 27, 35
 EDML, 21, 27, 32, 35–37
 Hans Tausen, 27–28, 35
 NorthGRIP, 27, 35
 stuck, 21

tower, 27, 32, 36
 trench, 24, 26, 28, 29, 31–33
 temperature, 26
 Drilling fluid, 31, 36
 Dronning Maud Land. *See* DML
 Dust, 21, 38
 Dye-3, 19

E

East Antarctica, 4, 20, 23
 EBSD, 40, 43
 EC. *See* European Commission
 Echo-free zone, 26, 27
 ECM, 2, 52
 EDC. *See* EPICA Dome C
 EDML. *See* EPICA DML
 Electrical Conductive Measurement. *See* ECM
 Energy
 grain-boundary, 2
 stored strain, 2, 3, 6–7, 14, 41, 49
 Environment, 10–11
 EPICA, 3, 18, 20–24, 38
 DML, 2, 17, 18, 20–28
 cutting plan, 37, 38, 41, 57
 Dome C, 2, 20–21
 -MIS, 21
 ESF. *See* European Science Foundation
 Etching, 17, 41, 43, 45
 European Commission, 20–22
 European Project for Ice Coring in Antarctica. *See* EPICA
 European Science Foundation, 19, 20

F

Fabric. *See* LPO
 analysis, 29, 40, 48, 52
 automatic. *See* AFA
 via EBSD. *See* EBSD
 Filchner Station, 25, 29, 30
 Firn, 3, 11–15, 31, 39, 41, 53
 –air interaction. *See* air–firn interaction
 deep, 13–15
 densification. *See* metamorphism
 density, 13–16, 46
 –ice transition. *See* transition, firn–ice
 layer. *See* layer, firn
 lower, 14, 46, 53
 metamorphism. *See* metamorphism
 model, 13–14
 pore space. *See* pore space
 shallow, 13, 15
 temperature
 EDML, 24, 46, 53
 upper, 14
 Firnification. *See* metamorphism
 Flow
 diffusional. *See* creep, diffusional
 instability, stratigraphic disturbance, 17
 –line, 24, 25
 of ice. *See* ice flow
 Fold, 53, 55, 58
 Form, 10–11
 Fractionation, 16–18
 Fresh ice. *See* ice, fresh

- G**
- Gas hydrate. *See* clathrate hydrate
- GBS, 3, 5, 13, 55
- Georg von Neumayer Station, 28
- GISP, 19
- GISP2, 3, 19
- Glacial period, 16
- last, 19, 51, 54
 - penultimate, 53, 55
- Glacier, 3
- outlet, 3, 4
- Glaciology, 1
- Grain, 3, 41, 42, 45
- boundary, 3, 6–7, 15, 40–43, 46, 49, 50, 55
 - energy, 5
 - groove, 17, 41, 45, 46, 50
 - loop, 50
 - misorientation. *See* misorientation
 - pinning, 50, 52
 - sliding. *See* GBS
 - growth, 3, 6, 41, 44, 52
 - dynamic, 2
 - normal, 5–6, 44, 46 - island, 50
 - misorientation. *See* misorientation
 - nucleation. *See* SIBM-N
 - size, 10, 11, 15, 41, 44–46, 51–55
 - splitting. *See* recrystallization, rotation
 - stereology, 3, 5, 40
 - sub-. *See* subgrain
 - subdivision, 3, 6, 44
 - two-sided, 49, 50
- Greenhouse gases, 19
- Greenland, 4, 5, 19, 20, 22, 26
- Greenland Ice Core Project. *See* GRIP
- Greenland Ice Sheet Project. *See* GISP
- GRIP, 3, 19–20
- H**
- Halley V Station, 30
- Hans Tausen
- drill. *See* drill, Hans Tausen
 - Ice Cap, 35
- Hein Blöd, 37
- Heinrich event, 11
- Hexagonal ice type I, *See* type IH
- Holocene, 51, 54
- Hydrate. *See* clathrate hydrate
- Hydrogen, 42
- bond, 42
- I**
- Ice
- air age difference. *See* dating of ice cores
 - Ih, 42
 - basal. *See* basal ice
 - brittle, 2, 32, 57
 - bubble-free, 50, 51, 54, 58
 - bubbly, 2, 12–16, 46, 48, 49, 53, 57, 58
 - cap, 3, 35
 - chemistry. *See* impurity
 - cloudy. *See* cloudy band
 - core
 - Byrd, 19, 20
 - Camp Century, 19
 - Dome Fuji, 20
 - Dye-3, 19
 - EDC, 20–21
 - EDML, 20–22, 24, 36, 43–44, 46, 54, 57
 - first Antarctic, 19
 - first to reach bedrock, 19
 - GISP2, 19, 22, 52
 - GRIP, 19, 22, 52
 - Law Dome, 20
 - line-scanner. *See* line-scanner
 - Little America V, 19
 - NBSAE, 19
 - NEEM, 22
 - NorthGRIP, 4, 22, 52
 - processing, 4, 32–38
 - Siple Dome, 20
 - storage. *See* ice storage
 - Taylor Dome, 20
 - transportation, 4, 33, 35
 - Vostok, 19, 20 - dating. *See* dating of ice cores
 - deep, 2
 - divide, 24, 28
 - dome, 3
 - drift, 2
 - environment interaction. *See* SFEI
 - flow, 3, 9, 10, 39–40, 44
 - EDML, 24, 28, 53, 55 - fresh, 17, 35, 41
 - inland, 4
 - isotropic, 4
 - land, 3–4
 - marine, 4
 - mechanical properties, 10, 14, 40, 53, 55
 - meteoric, 4–5
 - pack. *See* pack ice
 - physical properties, 21, 35, 38, 43
 - rheology. *See* ice mechanical properties
 - ridge, 3, 24, 53
 - sea. *See* sea ice
 - shallow, 6, 46
 - sheet, 3–5, 9
 - shelf, 3–4, 9, 11
 - Ekström, 28
 - Filchner–Ronne, 25 - soft, 55
 - storage, 4, 17, 18, 26, 32, 33, 35
 - stream, 3–4
 - temperature, 44
 - Antarctica, 9
 - EDML, 53, 55 - thickness, 23
 - tongue, 4 - Iceberg, 2, 4, 6, 9, 11, 25
 - Ice
 - IGY, 19
 - Impurity, 2, 4, 10, 11, 14–16, 21, 38, 51–55
 - Inclusion, 4–5, 10, 11, 14, 16, 47, 57
 - micro-. *See* microinclusion - Insolation, 16
 - Interaction
 - air–firn. *See* air–firn interaction
 - air–snow. *See* air–snow interaction
 - ice–environment. *See* SFEI - Interference (optics), 42, 45

- Interglacial period
last, 53, 55
- Intergovernmental Panel on Climate Change. *See* IPCC
- International Geophysical Year. *See* IGY
- International Polar Year. *See* IPY
- IPCC, 22
- IPY, 18–19
- Isochron. *See* layer, isochron
- Isotope, 11, 21, 38
- K**
- Kink band, 4, 47
- Kohnen Station, 12, 20, 21, 24–28
- L**
- Lattice
crystalline, 3, 40
defect, 2, 4–7
misorientation. *See* misorientation
preferred orientation. *See* LPO
rotation. *See also* recrystallization, rotation3
structure, 4, 42
- Law Dome, 20
- Layer
cloudy. *See* cloudy band
firn, 11, 14, 39, 45, 48
isochron, 25, 28, 47
snow, 39, 48
- Layering. *See* stratigraphy
- Line-scanner, 38, 46–48, 57, 58
- Logged depth. *See* depth, logged
- Logging, 4, 26, 32, 33
- LPO, 4–5, 11, 40, 41, 44, 48, 52–55
- M**
- Mass balance, 9, 16
- Maudheim, 18
- Medium
granular, 3
polycrystalline, 1–5, 9, 10, 40, 42
porous, 3
- Megadune, 5–6, 11
- Melting point, 2, 9, 40
- Metamorphism, 11, 13–16, 48, 53
- Microbubble, 5, 18
- Microinclusion, 2, 5, 10, 18, 43, 46, 47, 50–52, 54, 55
- Microscopy
electron
backscatter diffraction. *See* EBSD
scanning. *See* SEM
optical, 27, 39–41
- Microshear, 5, 55
boundary. *See* boundary, microshear
- Microstructure, 5, 10, 14–15, 17, 18, 35, 40–41, 43–46, 53, 54
mapping, 27, 31, 34, 35, 38, 40–43, 45–47, 51
paradigm shift, 43
- Misorientation, 3, 7, 41, 47
- Multidisciplinarity, 1, 39
- Multiscale
interaction, 10, 40
structure, 5, 10, 11, 13, 15, 19, 40, 42, 53–55
- N**
- NBSAE, 5, 18–19
- Neumayer Station I. *See* Georg von Neumayer Station
- Neumayer Station II, 25, 35
- NGG. *See* grain growth, normal
- NGRIP. *See* NorthGRIP
- Nicol prism. *See* polarizer
- Nitrogen, 16
- North Atlantic, 11, 19
- NorthGRIP, 5
- Norwegian–British–Swedish Antarctic Expedition. *See* NBSAE
- Nucleation, 5
classical, 3
crystal. *See* crystal nucleation
grain. *See* SIBM-N
pseudo-, 3, 49, 50, 53
- O**
- Optic axis. *See* c-axis
- Orientation
lattice preferred. *See* LPO
mis-. *See* misorientation
stereology, 4–5
- Oxygen, 16, 42
- P**
- Pack ice, 2, 6
- Paradigm
shift, microstructure. *See* microstructure paradigm shift
tripartite. *See* Tripartite Paradigm
- Plane
basal, 6, 42
prismatic, 42
pyramidal, 42
- Plasticity. *See* ice, mechanical properties
- Plate-like inclusion. *See* PLI
- PLI, 6–7, 18
- Polarizer, 40, 42, 45
- Polarstern, RV, 25, 35
- Polycrystal. *See* medium, polycrystalline
- Polygonization. *See* grain subdivision
- Pore
close-off depth. *See* transition, firn–ice
space, 10, 11, 13–16, 53, 54, 57
- Porosity. *See* pore space
- Pressure
borehole. *See* borehole pressure
bubble. *See* bubble pressure
clathrate–hydrate dissociation, 2, 16, 17
- Process
dynamic, 2–3, 6
elementary, 2, 5, 6
phenomenological, 2, 3, 5–6
static, 3, 5–6
- Proxy, 6, 10, 11, 17, 39, 41, 52
- Q**
- Quar Ice Shelf, 18
- R**
- Radar, 11, 23–24, 55
- Radio-echo sounding. *See* radar

- Recovery, 2, 6, 40, 46
 Recrystallization, 2, 3, 5–6, 13–15, 17, 35, 40, 41, 44, 46, 49, 50, 53, 55
 migration, 5–6, 44, 53
 rotation, 3, 6–53
 Refraction
 double. *See* birefringence
 index, 40, 41, 51
 Relaxation, 2, 6, 17, 18, 35, 41, 43
 RES. *See* radar
 RRX. *See* recrystallization, rotation
- S**
 SANAE IV Station, 30
 Sastruga, 6, 11, 30, 48, 53
 Scanning Electron Microscopy. *See* SEM
 SCAR, 22
 Scientific Committee on Antarctic Research. *See* SCAR
 Sea
 ice, 4, 6
 level rise, 9, 16
 SEM, 40
 SFEI, 5–6, 9–11, 40
 SIBM, 5–7
 -N, 3, 5–6, 14, 44–46, 49, 52, 53
 -O, 5, 14, 45, 49, 53
 Silicone oil, 41, 45
 Sintering. *See* metamorphism
 Siple Dome, 20
 Slip band, 6, 40, 43, 47
 Snow, 11, 13, 53
 accumulation, 9, 11, 12, 16, 19, 23, 24
 -air interaction. *See* air-snow interaction
 chemistry, 9, 11
 cover, 11, 13, 39, 48
 crystal, 1, 11–12, 53
 layer. *See* layer, snow
 metamorphism. *See* metamorphism
 sintering. *See* metamorphism
 sublimation. *See* sublimation
 Snowdrift, 11, 13, 30, 48, 53
 Snowfall. *See* snow accumulation
 Snowflake. *See* snow crystal
 Soft ice. *See* ice, soft
 South Pole, 23
 Southern Ocean, 11
 Strain, 53
 accommodation. *See* strain, inhomogeneous
 energy. *See* energy, stored strain
 hardening, 14
 -induced anisotropy. *See* LPO
 inhomogeneous, 14, 44, 46, 53
 rate, 2, 55
 softening, 14, 52, 53
 Stratigraphic disturbance, 10, 17, 22, 40, 48, 52, 53, 55, 57
 Stratigraphy, 10, 23–25, 28, 39, 40, 46–48, 51–55
 Stratum. *See* layer
 Stress
 EDML, 28, 46, 53
 internal, 2, 3, 14, 44, 46, 53
 relaxation. *See* relaxation
 Structure, 10–11, 40
 -form–environment interplay. *See* SFEI
 lattice. *See* lattice structure
 micro-. *See* microstructure
 multiscale. *See* multiscale structure
 subglacial. *See* subglacial structure
 Subglacial
 structure, 7, 17
 water, 21, 32, 37
 Subgrain, 3, 7
 boundary, 2, 3, 7, 40, 41, 43, 45, 46, 49, 50
 groove, 41, 47
 loop, 49
 misorientation. *See* misorientation
 growth, 3, 49
 island, 49
 rotation, 3, 49
 Sublimation, 11, 13, 14, 17, 41
 Summit, 19
 Surface
 roughness. *See* topography, surface
 slope. *See* topography, surface
 temperature
 EDML, 24
 Symmetry
 hexagonal, 6, 42
 snow crystal. *See* snow crystal
- T**
 Taylor Dome, 20
 Temperature
 bed. *See* bed temperature
 clathrate-hydrate dissociation, 2, 16, 17
 drill & science trench. *See* drill-trench temperature 28
 firn. *See* firn temperature, 12
 homologous, 2, 9, 40
 ice. *See* ice temperature
 proxy. *See* proxy
 seasonal variation, 12
 EDML, 24
 shock, 2
 surface. *See* surface temperature
 Texture. *See* LPO
 Three-stage model. *See* Tripartite Paradigm
 Tomography. *See* X-ray tomography
 Topography
 bed, 3, 23, 25, 26, 28
 surface, 23, 25, 28, 53
 Transantarctic Mountains, 4
 Transition
 bubble–hydrate, 1–2, 16–18, 48, 51, 53, 54
 firn–ice, 2, 3, 12–16, 39, 53
 girdle–single–maximum, 54, 55
 MIS1–MIS2, 51, 54
 MIS4–MIS5, 55
 MIS5e–MIS6, 53, 55
 Trench
 borehole. *See* borehole trench
 drill & science. *See* drill trench
 Tripartite Paradigm, 43–46
 Tyndall figure, 6–7
- U**
 Upscaling, 11
- V**
 Vostok Station, 19, 20

W

Water, [7](#), [9](#), [21](#), [32](#), [37](#)
molecule, [2](#), [16](#), [42](#)
subglacial. *See* subglacial water
vapour, [7](#), [12](#)

Weddell Sea, [25](#)

West Antarctica, [4](#)

Wind

crust, [7](#), [11](#), [15](#), [53](#)
erosion, [11](#), [13](#), [14](#)
katabatic, [5](#), [30](#)

World War I, [23](#)

World War II, [18](#), [19](#)

X

X-ray

diffraction, [40](#)
tomography, [40](#)

Z

Zone

BHT. *See* transition, bubble-hydrate
brittle. *See* ice, brittle
echo-free. *See* echo-free zone
firn. *See* layer, firn
firn-ice transition. *See* transition, firn-ice
snow. *See* layer, snow

Author Index

A

Ahlmann, H. W., [18](#)
Amundsen, R. E. G., [23](#)

B

Bader, H., [19](#)

D

Dansgaard, W., [19](#)
Descartes, R., [1](#)

E

Eliot, T.S., [39](#)

G

Giæver, J., [18](#)

H

Haakon VII, King of Norway, [23](#)
Hansen, B. L., [19](#)

J

Jouzel, J., [20](#)

K

Kepler, J., [1](#)
Kohnen, H., [28](#)

L

Langway, Jr., C., [19](#)

M

Maud, Queen of Norway, [23](#)
Miller, H., [20](#)

N

Neumayer, G. B. von, [18](#)

O

Oeschger, H., [19](#)

R

Robin, G., [18](#)

S

Schytt, V., [18](#)
Scott, R. F., [23](#)
Stauffer, B., [19](#), [21](#)
Sultan bin Salman, Prince of Saudi Arabia, [9](#)

W

Weyprecht, C., [18](#)
Wittgenstein, L., [57](#)
Wolff, E., [21](#)