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Assessing the global contribution of marine aerosols, terrestrial bioaerosols, and desert dust to ice-nucleating particle concentrations

Marios Chatziparaschos et al.

Correspondence to: Maria Kanakidou (mariak@uoc.gr)

Supplementary Figures

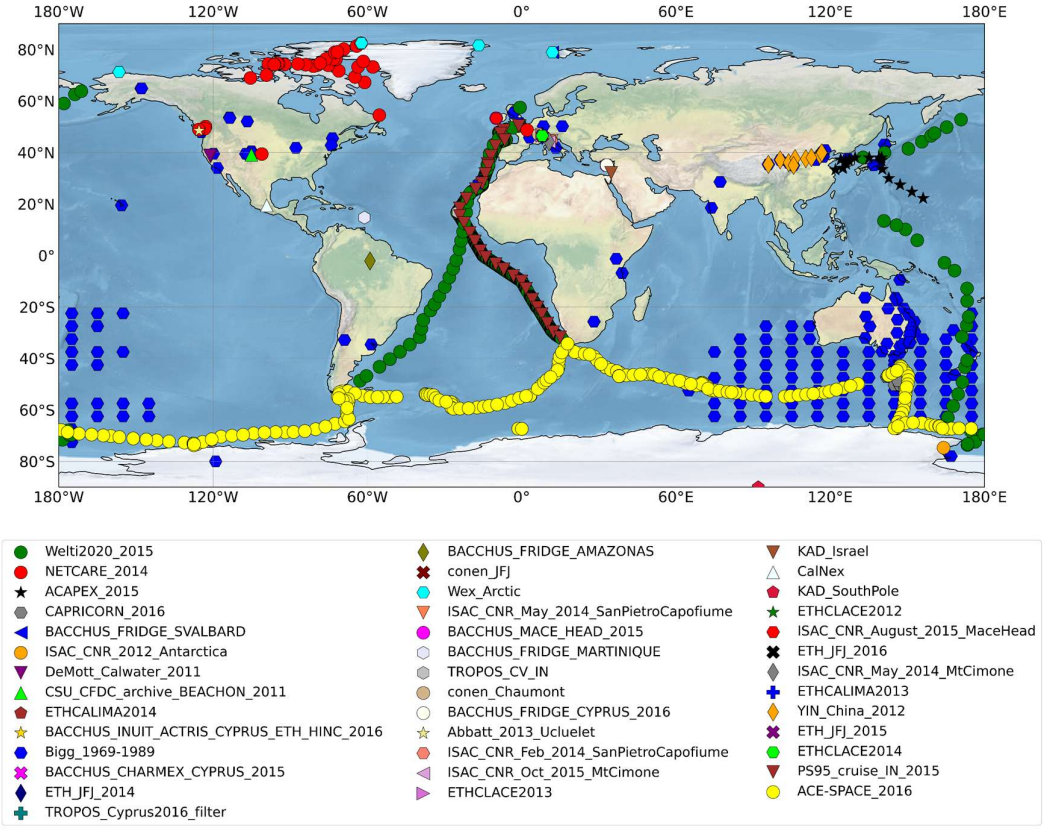

Figure S1: Location of the data used for comparison in Figures 10, S6 and S7. For further information see ***Table S1***

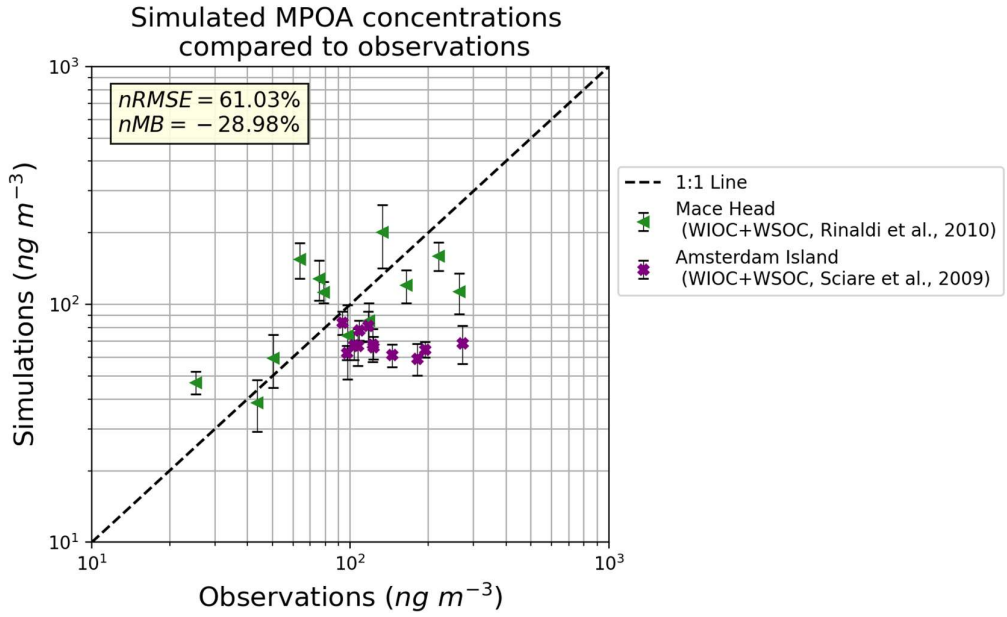

Figure S2: Simulated concentrations of MPOA compared with Mace Head (green) and Amsterdam Island (violet) measurements.

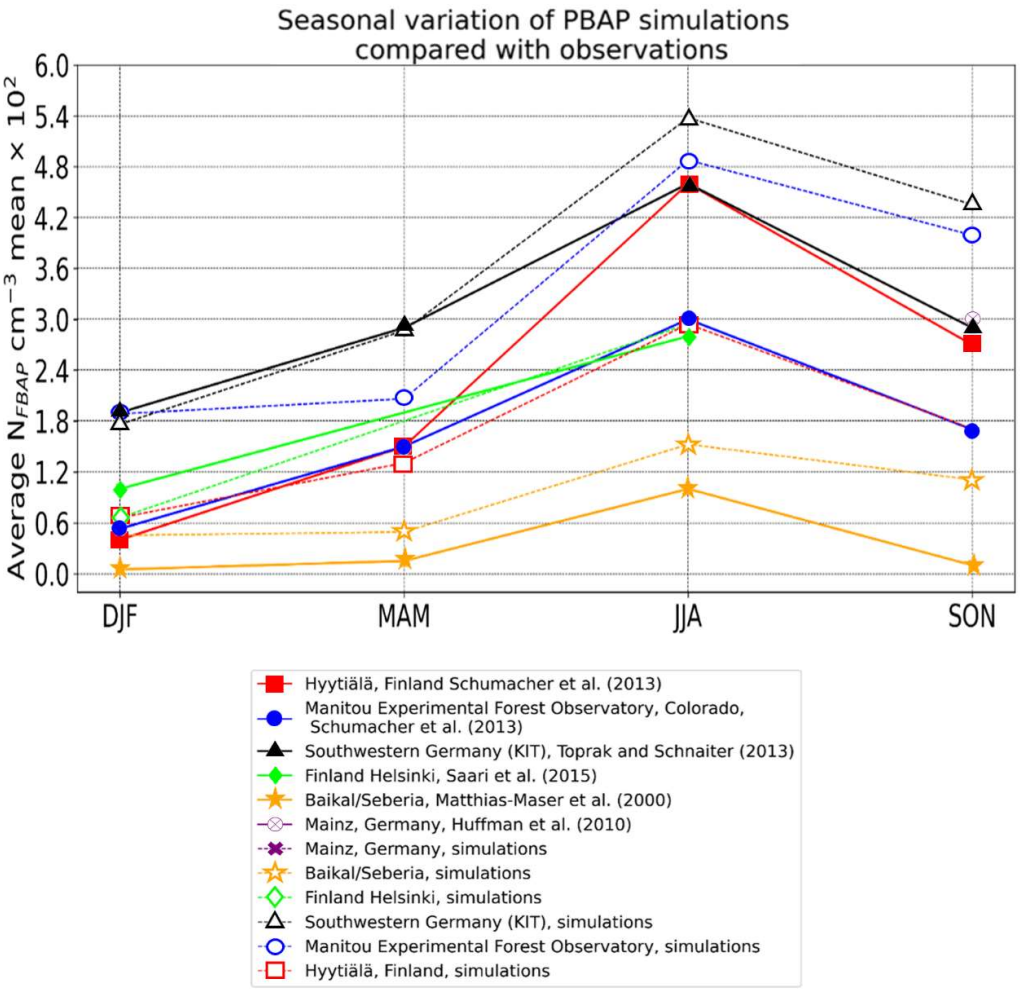

Figure S3: Seasonal variation of simulated number concentrations of PBAP compared to long-term (>4 weeks) FBAP observations compiled by Petersson Sjögren et al. (2023). Continuous lines are observations and dashed lines simulated number concentrations.

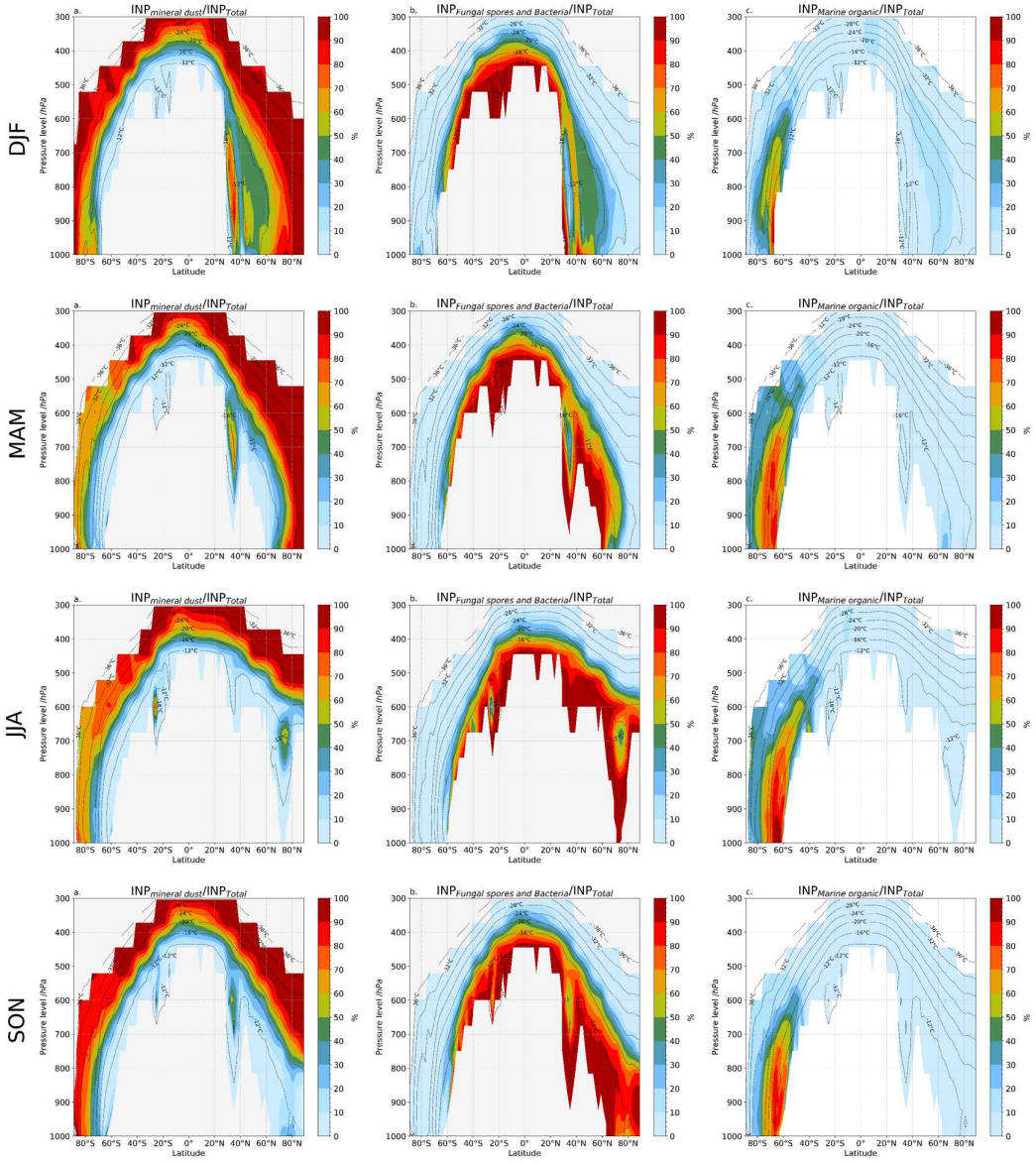

Figure S4: Seasonal percentage contribution of a) mineral dust, (b) fungal spores and bacteria and (c) marine organic aerosols calculated by TM4-ECPL where the total $[INP]_{ambient}$ concentration is larger than $0.01 m^{-3}$. The black contour lines represent seasonal mean isotherms in ºC.

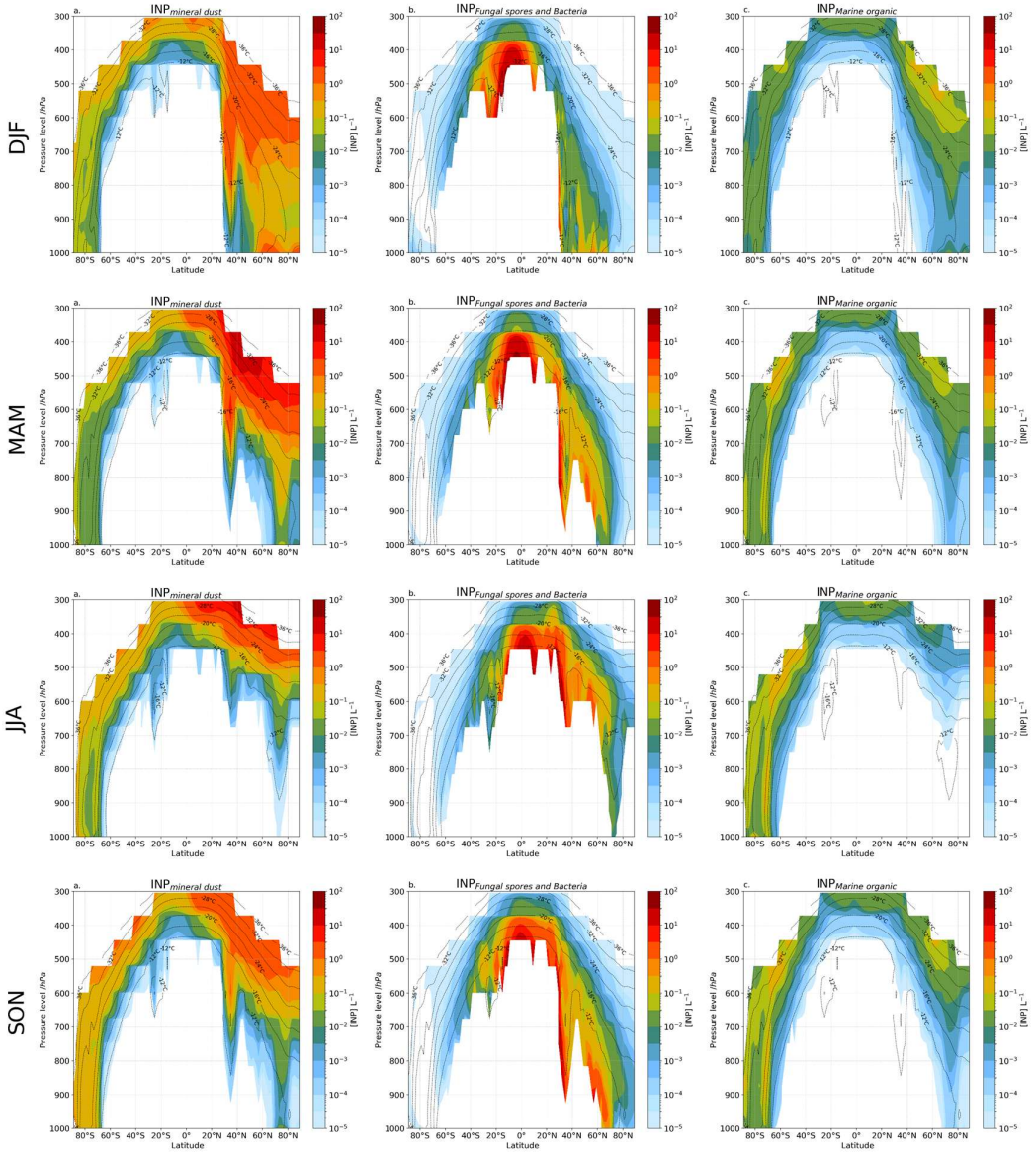

Figure S5*: S*easonal mean concentration of a) mineral dust, (b) fungal spores and bacteria and (c) marine organic aerosols calculated by TM4-ECPL where the total $[INP]_{ambient}$ concentration is larger than $0.01 m^{-3}$. The black contour lines represent seasonal mean isotherms in °C.

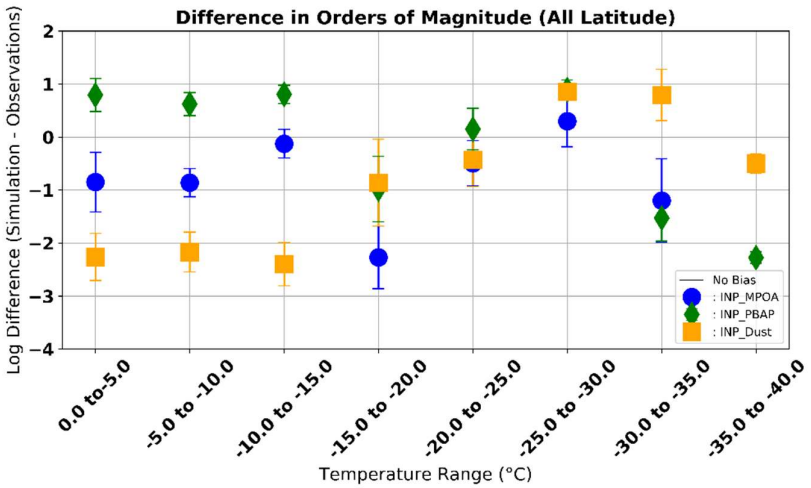

Figure S6: Order of magnitude / Logarithm of the deviation of simulated concentrations of INP types from total INP observations, as a function of binned temperatures in ºC. INP_{Dust} in yellow, INP_{PBAP} in green, INP_{MPOA} in blue.

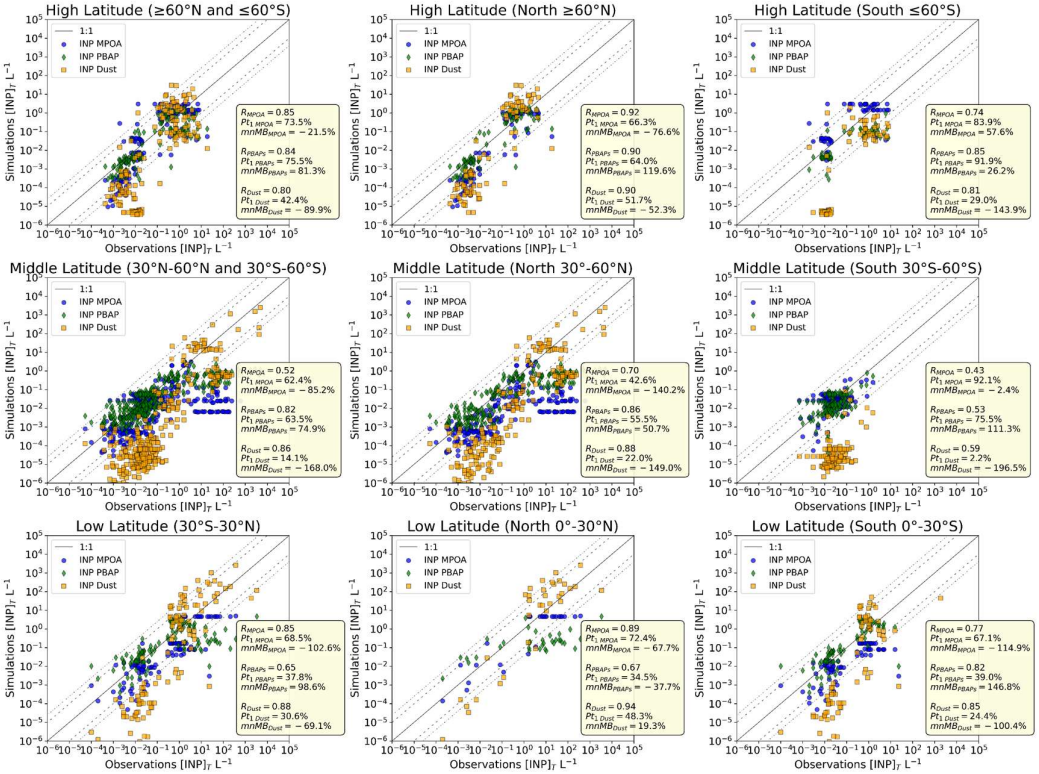

Figure S7: Comparison of INP concentrations calculated at the temperature of the measurements against total INP observations accounting for mineral dust (yellow), MPOA (blue), PBAP (green) separated in high, middle and low latitudes.

Table S1: Data sets used for this study. Campaign/data

Campaign/data set	*Location*	*References*
Arctic station Barrow/Utqiagvik	Arctic	(Wex et al., 2019)
Alert (Canadian Arctic Station)	Arctic	
Arctic station Ny-Ålesund	Arctic	
Station_Nord (Villum Research Station)	Arctic	

PS95 Atlantic Cruise 2015	Atlantic	(Welti et al., 2020)
KAD_Israel	Tel Aviv	(Ardon-Dryer and Levin, 2014)
KAD_South_Pole	South Pole	(Ardon-Dryer et al., 2011)
Conen_ Chaumont	Jungfraujoch and Chaumont	(Conen et al., 2015)
CYPRUS BACCHUS/CHARMEX 2015	Forestry Department site, Agia Marina	(Ansmann et al., 2019)
BACCHUS_FRIDGE AMAZONAS	Amazonian Tall Tower Observatory	(Schrod et al., 2020)
CalWater	Coastal California, Airborne	(Fan et al., 2014)
Conen_JFJ	Jungfraujoch	(Conen et al., 2015)
CLACE2014	Jungfraujoch	(Lacher et al., 2021, 2018, 2017) (Boose et al., 2016)
CLACE2013	Jungfraujoch	
CLACE2012	Jungfraujoch	
CalNex	California	(Wang et al., 2012)
CALIMA 2014	Izana observatory, Tenerife	(Boose et al., 2016)
CALIMA 2013	Izana observatory, Tenerife	(Boose et al., 2016)
ISAC-CNR MaceHead BACCHUS Campaign	Mace Head Observatory, Carna, Galway, Ireland	(Rinaldi et al., 2016)
ISAC-CNR SanPietro_Capofiume BACCHUS Campaign	San Pietro Capofiume (BO, Italy)	(Belosi et al., 2017)
ISAC_CNR_MtCimone BACCHUS Campaign	mountain observatory Mt. Cimone	(Rinaldi et al., 2017)
ISAC-CNR Antarctica BACCHUS Campaign	Mario Zucchelli Station, Terranova Bay, Antarctica	(Belosi et al., 2014)
BACCHUS_FRIDGE_SVALBARD Campaign	Zeppelin Observatory, Svalbard/Spitzbergen	(Schrod et al., 2020)
BACCHUS_FRIDGE_MARTINIQUE	Volcanic and Seismologic Observatory, Fonds-Saint-Denis, Martinique, Caribbean	(Schrod et al., 2020)
CSU_CFDC_archive_BEACHON	Manitou Experimental ForestObservatory (MEFO)	(Tobo et al., 2013)

ETH_JFJ_2014	Jungfraujoch High Altitude Research Station	(Lacher et al., 2017)
ETH_JFJ_2016	Jungfraujoch High Altitude Research Station	(Lacher et al., 2017, 2018)
ETH_JFJ_2015	Jungfraujoch High Altitude Research Station	(Lacher et al., 2017)
TROPOS_Cyprus2016	Agia Marina, Xyliatou, Cyprus	(Ansmann et al., 2019; Schrod et al., 2017)
TROPOS_CV_IN	Cape Verde	(Welti et al., 2018)
Yin_China	China	(Yin et al., 2012)
NETCARE_2013	Coastal (West coast of Canada)	(Mason et al., 2015)
Bigg_1969-1989	Australia, Southern Ocean, Argentina, Africa, India, Japan/Korea, Antarctica, Hawaii, Tasmania,	https://www.bacchus-env.eu/in/ (Bigg, 1973, 1990)
NETCARE	Canadian Arctic	(Irish et al., 2019)
ACAPEX	Bodega Bay (California)	(DeMott and Hill, 2016)
CAPRICORN	South of Australia	(McCluskey et al., 2018)
ACE-SPACE	Atlantic	(Welti et al., 2020)

Eq1. Modified normalised mean bias (MNMB)

$$\mathrm{MNMB} = \frac{2}{N}\sum_{i}\frac{f_i - o_i}{f_i + o_i}$$

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