

Supplementary information

Includes supplementary table, figures, and reference list

Supplementary Table. List of records identified as relevant for the database (see Section 3 in the main text), and their classification in terms of confidence level (high, medium, low). The identification of the sources of uncertainty (according to the criteria discussed in the main text) is made explicit. Uncertainties are labeled as either substantial (x) or critical (xx).

Supplementary Figures. Comparison of simulated dust deposition ($\text{g/m}^2/\text{a}$) for the 6 ka BP case, compared to observational estimates of the fine ($< 10 \mu\text{m}$) eolian Mass Accumulation Rate for the corresponding periods, based on a 2 ka pace. (a) Observations; (b) model; (c) model versus observations scatterplot. Horizontal bars represent the variability of observational data averaged within the corresponding 2 ka time lapse (1 sigma). Locations of observational sites are clustered in the scatterplots based on their geographical location, as indicated by the color-coding. In the bottom scatterplot, squares indicate high confidence level, diamonds represent medium confidence level; (d) spatial distribution of the dominant sources for dust deposition. Figure S1: 2 ka BP. Figure S2: 4 ka BP. Figure S3: 6 ka BP. Figure S4: 8 ka BP. Figure S5: 10 ka BP.

Supplementary Table

Site / area	Archive	Confidence level	Age model / SBMAR	Determination of EC	Separation of remote vs local	Sources of uncertainty	Reference	Additional references
EDC	ice core	high					Delmonte et al., 2004	
Vostok-BH7	ice core	high					Delmonte et al., 2004	
GISP2	ice core	medium		x		calcium proxy	Mayewski et al., 1997	Ruth et al., 2002, 2008
EN06601-0038PG	marine core	high					Francois et al., 1990	
EN06601-0021PG	marine core	high					Francois et al., 1990	
EN06601-0029PG	marine core	high					Francois et al., 1990	
OC437-07-GC27	marine core	medium		x		possible unaccounted for, non-eolian inputs	McGee et al., 2013	
OC437-07-GC37	marine core	high					McGee et al., 2013	
OC437-07-GC49	marine core	high					McGee et al., 2013	
OC437-07-GC66	marine core	medium		x		possible unaccounted for, non-eolian inputs	McGee et al., 2013	
OC437-07-GC68	marine core	high					McGee et al., 2013	
RC24-12	marine core	high					Bradtmitter et al., 2006	
RC24-07	marine core	high					Bradtmitter et al., 2006	
RC24-01	marine core	high					Bradtmitter et al., 2006	
V22-182	marine core	high					Bradtmitter et al., 2006	
V30-40	marine core	high					Bradtmitter et al., 2006	
PS2498-1	marine core	medium		x		possible non-local / non-eolian inputs	Anderson et al., 2014	Kohfeld and Harrison, 2001
RC27-42	marine core	high					Pourmand et al., 2007	
93KL	marine core	medium		x		possible non-eolian inputs	Pourmand et al., 2004	
ODP138-848B-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
ODP138-849A-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
ODP138-850A-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
ODP138-851E-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
ODP138-852A-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
ODP138-853B-1H-1	marine core	medium	x			stratigraphic correlation age model	McGee et al., 2007	
TT013-PC72	marine core	high					Anderson et al., 2006	
TT013-MC27	marine core	high					Anderson et al., 2006	
TT013-MC69	marine core	high					Anderson et al., 2006	
TT013-MC97	marine core	high					Anderson et al., 2006	
TT013-MC19	marine core	high					Anderson et al., 2006	
V28-203	marine core	high					Bradtmitter et al., 2007	
V21-146	marine core	medium	x			age model	Hovan et al., 1991	
SO-14-08-05	marine core	medium	x			age model	Hesse and McTainsh, 2003; Fitzsimmons et al., 2013	
E26.1	marine core	medium	x			age model	Hesse, 1994; Fitzsimmons et al., 2013	
Zagoskin_Lake	lake	medium	x			age model	Muhs et al., 2003b	
Chitina	loess / paleosol	medium	x			age model	Muhs et al., 2013	
Luochuan, China	loess / paleosol	medium	x			Age model	Lu et al., 2013	
Jiuzhoutai	loess / paleosol	medium	x			age model	Kohfeld and Harrison, 2003	

Duowa	loess / paleosol	medium	x			age model	Roberts et al., 2001	
Beiguoyuan	loess / paleosol	medium	x			age model	Stevens and Lu, 2009	
Xifeng	loess / paleosol	medium	x			age model	Stevens and Lu, 2009	
OWR	loess / paleosol	medium	x			age model	Miao et al., 2007	
LRC	loess / paleosol	medium	x			age model	Miao et al., 2007	
Dome B	ice core	low	xx			age model	Delmonte et al., 2004	Jouzel et al., 1995
TALDICE	ice core	low			xx	local sources	Albani et al., 2012	Delmonte et al., 2010; Delmonte et al., 2013
Siple Dome	ice core	low		x	x	calcium proxy, possible local sources	Mayewski et al., 2013	Ruth et al., 2002, 2008; Delmonte et al., 2013; Bory et al., 2010
Taylor Dome	ice core	low		x	x	calcium proxy, possible local sources	Mayewski et al., 2013	Ruth et al., 2002, 2008; Delmonte et al., 2013; Bory et al., 2010
Byrd	ice core	low		x	x	old particle counter data, possible local sources	Thompson et al., 1975, 1977	Delmonte et al., 2013; Bory et al., 2010
EDML	ice core	low		x	x	calcium proxy, possible local sources	Fischer et al., 2007	Ruth et al., 2002, 2008; Delmonte et al., 2013; Bory et al., 2010
Dome Fuji	ice core	low		xx		uncalibrated laser counter	Kawamura et al., 2003; Fujii et al., 2003	
Camp Century	ice core	low		x	x	old particle counter data, possible local sources	Thompson et al., 1975, 1977	Hansson, 1994; Bullard, 2013
Penny Ice Cap	ice core	low	xx		x	age model, local sources	Zdanowicz et al., 2000	C. Zdanowicz, personal comm.
Dunde	ice core	low	xx			age model	Thompson et al., 1997	L. G. Thompson, personal comm.
Guliya	ice core	low	xx			age model	Wu et al., 2004	L. G. Thompson, personal comm.
Puruogangri	ice core	low	xx			age model	Thompson et al., 2006	L. G. Thompson, personal comm.
Huascarán	ice core	low	xx		x	age model, local sources	Thompson et al., 1995	L. G. Thompson, personal comm.
Sajama	ice core	low	xx			age model	Thompson et al., 1998	L. G. Thompson, personal comm.
Kilimajaro	ice core	low	xx	x	x	age model, local sources, volcanic input	Thompson et al., 2002	Gabrielli et al., 2014; L. G. Thompson, personal comm.
Nevado Illimani	ice core	low	xx			age model	Ramirez et al., 2003	J.-R. Petit, personal comm.
ODP108-658C	marine core	low		xx		unaccounted for, non-eolian inputs	Adkins et al., 2006	McGee et al., 2013
SU81-18 (Iberian Margin)	marine core	low		xx		non-eolian inputs	Gherardi et al., 2005	
OCE326-GGC5 (North Atlantic)	marine core	low		xx		non-eolian inputs	McManus et al., 2004	Kohfeld and Harrison, 2001
KNR110-82GGC (Ceara Rise)	marine core	low		xx		possible riverine inputs from the Amazon	Francois et al., 1990	Ruddiman, 1997
KNR110-58GGC (Ceara Rise)	marine core	low		xx		possible riverine inputs from the Amazon	Francois et al., 1990	Ruddiman, 1997
KNR110-55GGC (Ceara Rise)	marine core	low		xx		possible riverine inputs from the Amazon	Francois et al., 1990	Ruddiman, 1997
RC13-189 (W Equatorial Atlantic)	marine core	low		xx		possible riverine inputs from the Amazon	Bradt Miller et al., 2006	Francois et al., 1990; Ruddiman, 1997
RC16-66 (W Equatorial Atlantic)	marine core	low		xx		possible riverine inputs from the Amazon	Bradt Miller et al., 2006	Francois et al., 1990; Ruddiman, 1997
V22-177 (Equatorial Atlantic)	marine core	low	xx			unconstrained sediment redistribution	Ruddiman, 1997	Bradt Miller et al. (2006); Francois et al., 1990
V29-144 (Equatorial Atlantic)	marine core	low	xx	xx		unconstrained sediment redistribution; possible riverine inputs from Congo river	Ruddiman, 1997	Bradt Miller et al. (2006); Francois et al., 1990
V30-41K (Equatorial Atlantic)	marine core	low	xx			unconstrained sediment redistribution	Ruddiman, 1997	Bradt Miller et al. (2006); Francois et al., 1990
9501 (E Mediterranean)	marine core	low		xx		separation of riverine/eolian, no size	Box et al., 2011	
9509 (E Mediterranean)	marine core	low		xx		separation of riverine/eolian, no size	Box et al., 2011	
RC27-61 (Arabian Sea)	marine core	low	xx			age model	Clemens and Prell, 1990	
ODP117-722B (Arabian Sea)	marine core	low	xx			age model	Clemens and Prell, 1990	
JPC17 (Bering Sea)	marine core	low		xx		possible non-eolian/volcanic inputs	Kohfeld and Chase, 2011; Brunelle et al., 2007	Hovan and Rea, 1995; Serno et al., 2014; Kohfeld and Harrison, 2001
PC13 (Bering Sea)	marine core	low		xx		possible non-eolian/volcanic inputs	Kohfeld and Chase, 2011; Brunelle et al.,	Hovan and Rea, 1995; Serno et al., 2014; Kohfeld and

							2010	Harrison, 2001
RAMA 44 PC (Bering Sea)	marine core	low		xx		possible non-eolian/volcanic inputs	Kohfeld and Chase, 2011; Crusius et al., 2004	Hovan and Rea, 1995; Serno et al., 2014; Kohfeld and Harrison, 2001
ODP Site 887B (Bering Sea)	marine core	low		xx		possible non-eolian/volcanic inputs	Kohfeld and Chase, 2011; Jaccard et al., 2009	Hovan and Rea, 1995; Serno et al., 2014; Kohfeld and Harrison, 2001
ME0005-24JC (Panama Basin)	marine core	low		xx		possible non-eolian/volcanic inputs	Kienast et al., 2007	Olivarez et al., 1991
Y69-71P (Panama Basin)	marine core	low		xx		possible non-eolian/volcanic inputs	Kienast et al., 2007	Olivarez et al., 1991
P7 (Panama Basin)	marine core	low		xx		possible non-eolian/volcanic inputs	Kienast et al., 2007	Olivarez et al., 1991
ME0005-27JC (Panama Basin)	marine core	low		xx		possible non-eolian/volcanic inputs	Kienast et al., 2007	Olivarez et al., 1991
TR163-31P (Panama Basin)	marine core	low		xx		possible non-eolian/volcanic inputs	Kienast et al., 2007	Olivarez et al., 1991
TR163-31B (E Eq. Pacific)	marine core	low		xx		possible non-eolian/volcanic inputs	Boven and Rea, 1998	Olivarez et al., 1991
MD01-2407 (Japan Sea)	marine core	low	x	x		possible sediment focusing, riverine inputs	Nagashima et al., 2007	
O3167 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Kawahata, 1999	
C2188 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Kawahata, 1999	
C4402 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Kawahata, 1999	
MD97-2138 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Bradtmitter et al., 2007	Kawahata, 1999
MW91-9 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Bradtmitter et al., 2007	Kawahata, 1999
MD91-BC36 (Ontong-Java Plateau)	marine core	low		xx		possible non-eolian inputs	Bradtmitter et al., 2007	Kawahata, 1999
RC17-177	marine core	low		xx		possible non-eolian inputs	Bradtmitter et al., 2007	Kawahata, 1999
V20-122 (NW Pacific)	marine core	low	x	xx		age model, possible non-eolian inputs	Rea and Leinen, 1988	Hovan and Rea, 1995; Serno et al., 2014; D. Rea, personal comm.
V20-126 (NW Pacific)	marine core	low	x	xx		age model, possible non-eolian inputs	Rea and Leinen, 1988	Hovan and Rea, 1995; Serno et al., 2014; D. Rea, personal comm.
V20-129 (NW Pacific)	marine core	low	x	xx		age model, possible non-eolian inputs	Rea and Leinen, 1988	Hovan and Rea, 1995; Serno et al., 2014; D. Rea, personal comm.
RC14-105 (NW Pacific)	marine core	low	x	xx		age model, possible non-eolian inputs	Rea and Leinen, 1988	Hovan and Rea, 1995; Serno et al., 2014; D. Rea, personal comm.
NGC97 (Tasman Sea)	marine core	low	x	x		age model, aluminium proxy	Kawahata, 2000	
NGC99 (Tasman Sea)	marine core	low	x	x		age model, aluminium proxy	Kawahata, 2000	
E14-17 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E15-4 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E15-5 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E15-28 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E19-7 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E27-23 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
E36-36 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
V16-121 (Southern Ocean)	marine core	low		xx		possible non-eolian inputs (IRD)	Bradtmitter et al., 2009	Kohfeld and Harrison, 2001; Kohfeld et al., 2013
Tongsu maar, Cheju Island, Korea	lake	low		xx		quartz proxy	Lim and Matsumoto, 2008	
Lake Biwa, Japan	lake	low	x	xx		quartz proxy	Xiao et al., 1997	
Lake Huguang maar, China	lake	low	xx			inadequate temporal resolution for accumulation	Yancheva et al., 2007	G. Haug, personal comm.
Native Companion	lake	low	x		x	age model, local sources	McGowan et al., 2008; Petherick et al., 2009	

Lagoon, Australia								
Elk Lake, Minnesota	lake	low		x	x	aluminium proxy, no size, possible local sources	Dean et al., 1997	
Hongyuan, Tibet	peat bog	low		x	xx	dust proxy, separation of local/remote sources (size-dependent)	Ferrat et al., 2011	
Store Mosse, Sweden	peat bog	low		x	xx	dust proxy, separation of local/remote sources (size-dependent)	Kylander et al., 2013	
Old Man Range, New Zealand	peat bog	low		x	x	dust proxy, separation of local/remote sources (size-dependent)	Marx et al., 2009	
Upper Snowy Mountains, Australia	peat bog	low		x	xx	dust proxy, separation of local/remote sources (size-dependent)	McGowan et al., 2010	
Etang de la Gruere, Switzerland	peat bog	low		x	xx	dust proxy, separation of local/remote sources (size-dependent)	Le Roux et al., 2012	
Isla Navarino, Chile	peat bog	low		x	xx	dust proxy, separation of local/remote sources (size-dependent)	Sapkota et al., 2007	
Baxie (Chinese Loess Plateau)	loess / paleosol	low	xx	x		Section with potential local river sources	Kohfeld and Harrison, 2003	Sun et al., 2000
Halali (Chinese Loess Plateau)	loess / paleosol	low	xx	x		Section with potential local sources from the lacustrine sediments of Qinghai Lake	Kohfeld and Harrison, 2003	Sun et al., 2000
Yinwan (Chinese Loess Plateau)	loess / paleosol	low	xx	x		Section with potential local river sources	Kohfeld and Harrison, 2003	Sun et al., 2000
Dadiwan (Chinese Loess Plateau)	loess / paleosol	low	xx	x		Section with potential local river sources	Kohfeld and Harrison, 2003	Sun et al., 2000
Laoguantai, China	loess / paleosol	low	xx			lack of nearby sites in this compilation with matching horizon stratigraphy	Jia et al., 2008	

Figure S1

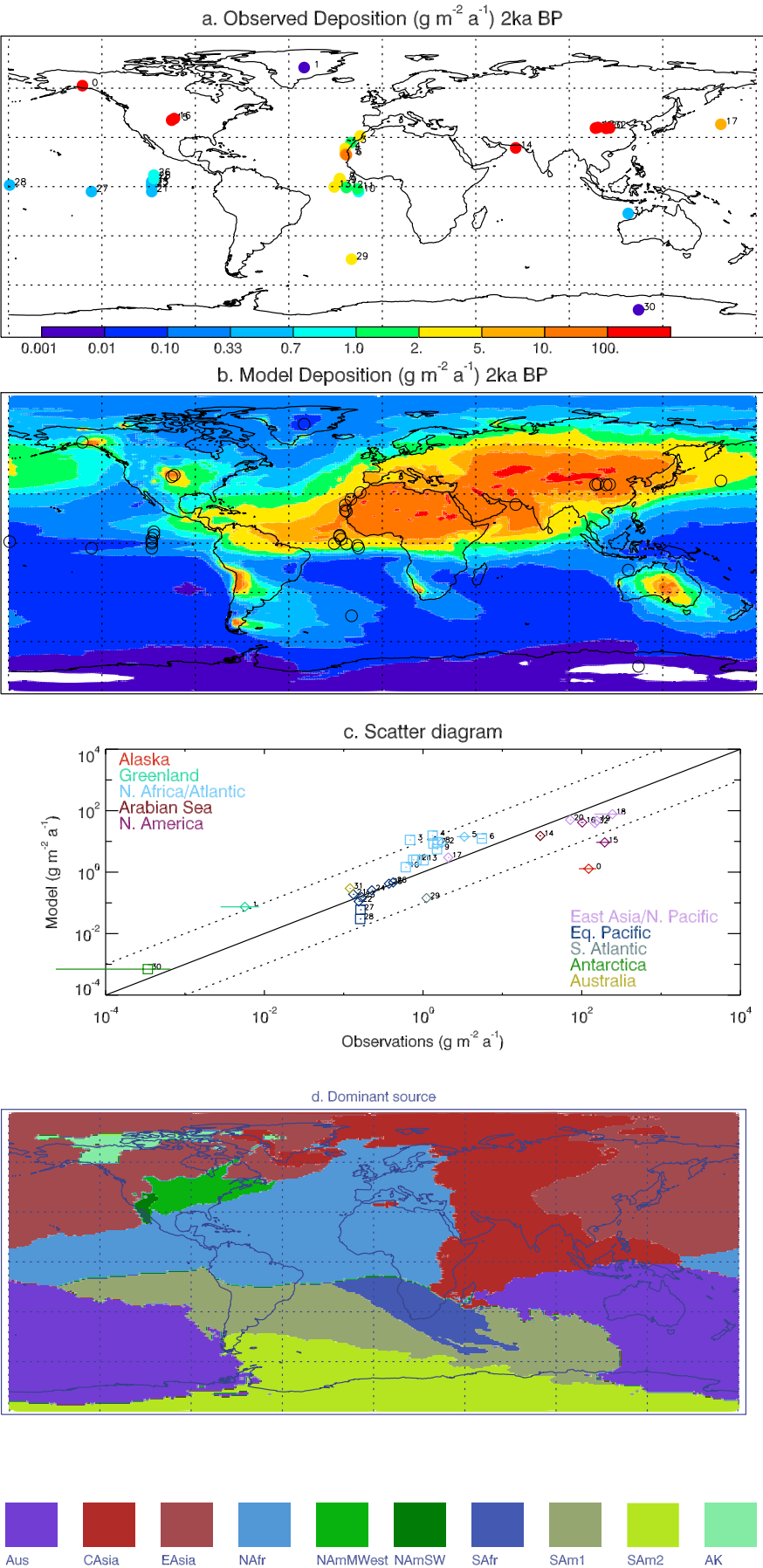


Figure S2

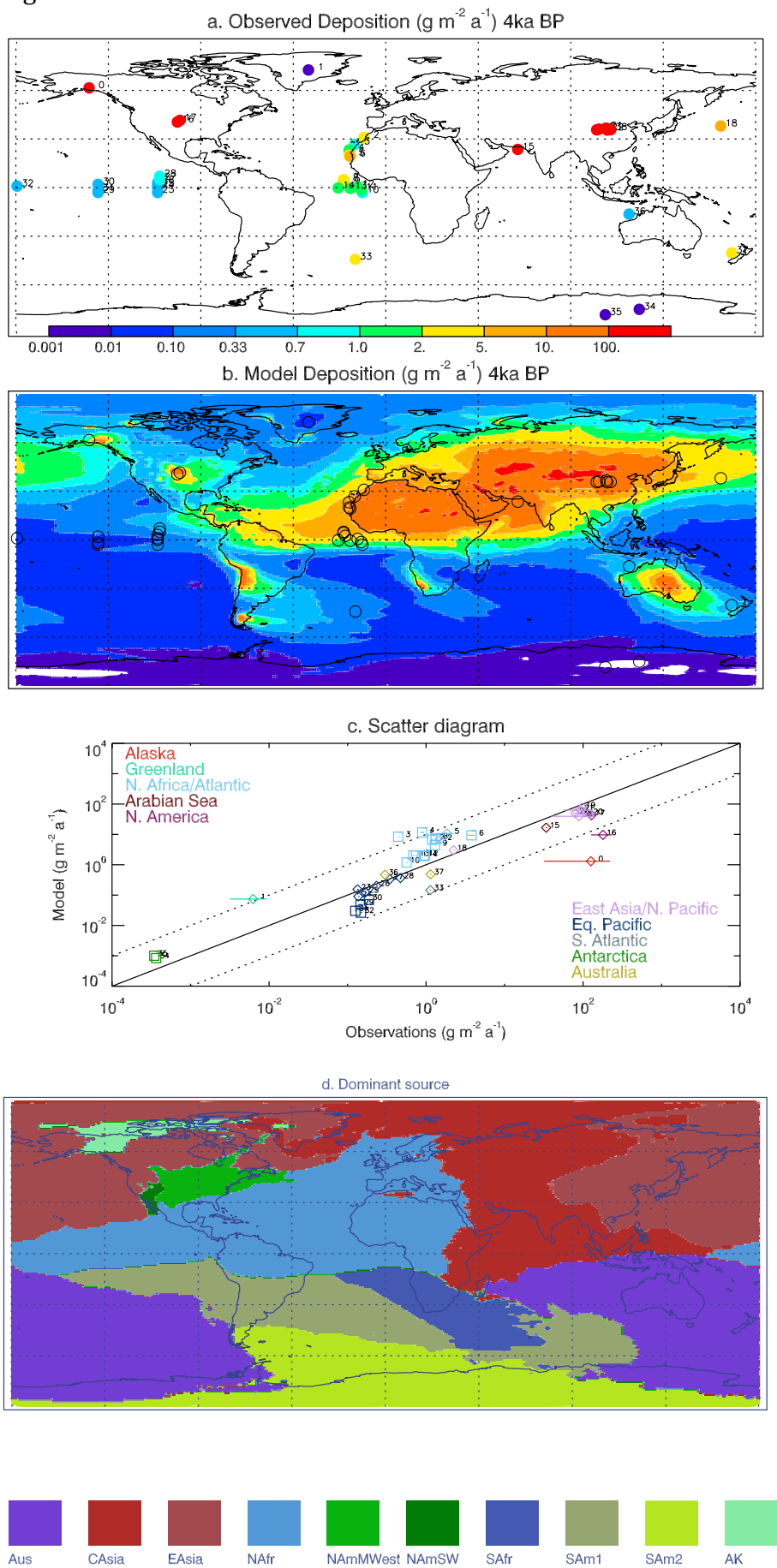


Figure S3

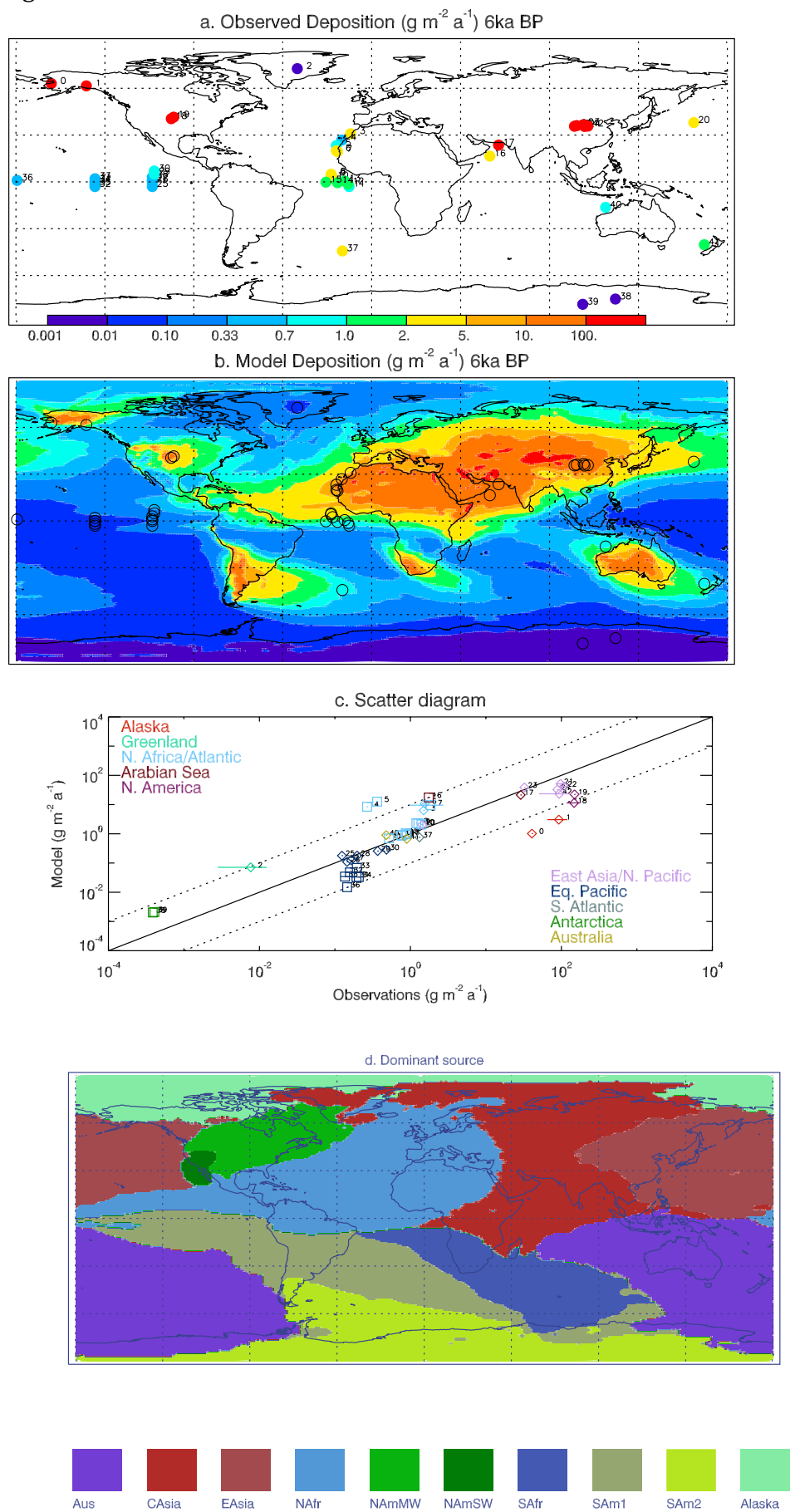


Figure S4

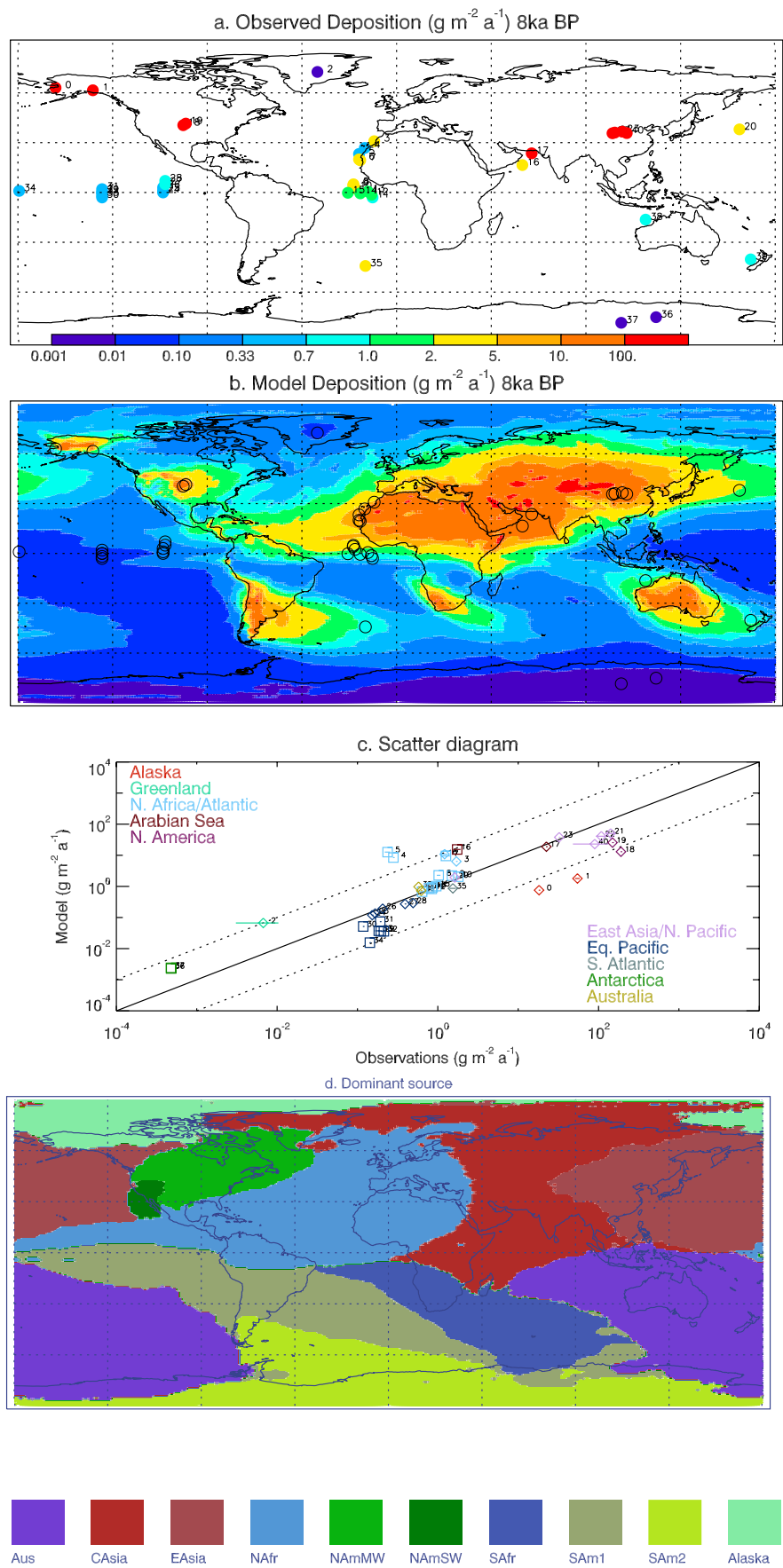
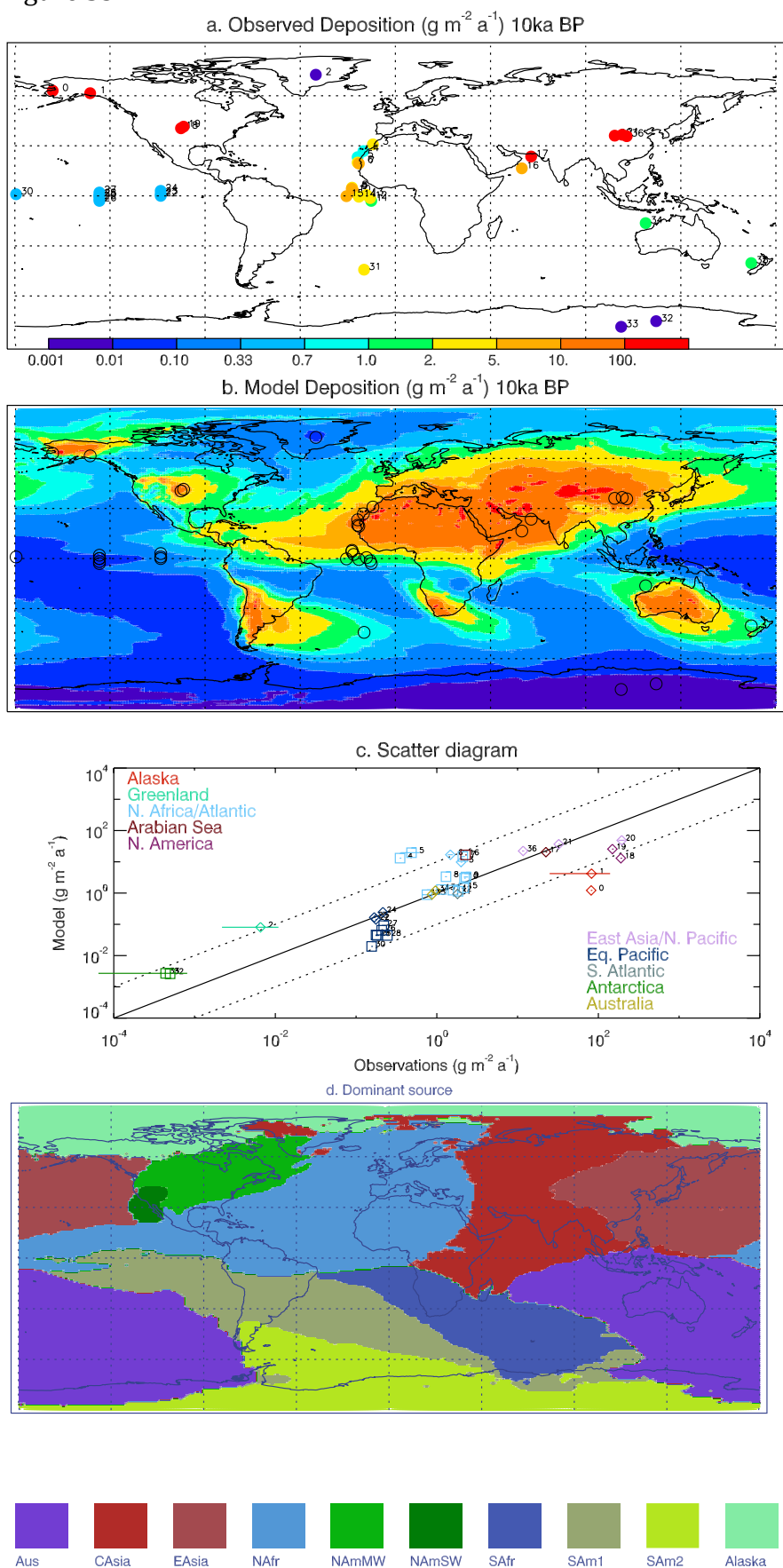


Figure S5



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