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A novel approach for characterizing the variability in mass–dimension relationships: results from MC3E

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Year	Author(s)	a (g cm-b)	b	Method [code descriptions below]	Environment	Notes
1935	Nakaya and Terada	0.000029	1	CG_Melt	Mountain	Needles
1935	Nakaya and Terada	0.00038	2	CG_Melt	Mountain	Plane dendritic crystals
1935	Nakaya and Terada	0.001	2	CG_Melt	Mountain	Spatial dendritic crystals
1935	Nakaya and Terada	0.0027	2	CG_Melt	Mountain	Crystals with liquid drops
1935	Nakaya and Terada	0.065	3	CG_Melt	Mountain	Graupel
1965	Magono and Nakamura	0.0105	1	CG_Melt	Large Scale Ascent	Aggregates of wet and dry snowflakes
1972	Heymsfield	0.0009	1.74	CIS_Melt	Cirrus	Columnar and bullet crystals l.t. -40 deg C
1972	Heymsfield	0.0079	2.5	CIS_Melt	Cirrus	Plates
1972	Heymsfield	0.044	3	CIS_Melt	Cirrus	Bullet rosettes
1972	Zikmunda and Vali	0.035	2.15	CG_Melt	Mountain	Conical graupel
1972	Zikmunda and Vali	0.079	2.53	CG_Melt	Mountain	Lump graupel
1974	Locatelli and Hobbs	0.001	1.4	CG_Melt	Mountain	Aggregates of unrimed side planes l.t. 4 mm
1974	Locatelli and Hobbs	0.0018	1.4	CG_Melt	Mountain	Aggregates of unrimed radiating groups of dendrites
1974	Locatelli and Hobbs	0.00294	1.9	CG_Melt	Mountain	Aggregates of densely rimed raditing groups of dendrites
1974	Locatelli and Hobbs	0.00294	1.9	CG_Melt	Mountain	Aggregates of unrimed radiating groups of plates bullets and columns
1974	Locatelli and Hobbs	0.003	2.3	CG_Melt	Mountain	Densely rimed dendrites
1974	Locatelli and Hobbs	0.0049	2.1	CG_Melt	Mountain	Densely rimed radiating groups of dendrites
1974	Locatelli and Hobbs	0.0053	2.4	CG_Melt	Mountain	Graupel like hexagonal snow
1974	Locatelli and Hobbs	0.0066	2.3	CG_Melt	Mountain	Densely rimed columns
1974	Locatelli and Hobbs	0.0074	2.1	CG_Melt	Mountain	Graupel like lump snow
1974	Locatelli and Hobbs	0.0291	2.6	CG_Melt	Mountain	Conical graupel
1974	Locatelli and Hobbs	0.035	2.9	CG_Melt	Mountain	Hexagonal graupel
1974	Locatelli and Hobbs	0.0492	2.8	CG_Melt	Mountain	Lump graupel
1988	Klaassen	0.0367	2	CG_Melt	Large Scale Ascent	Dry snowflakes adopted from Magono and Nakamura
1989	Kajikawa	0.000396	1.4	CG_Melt	Mountain	Plates
1989	Kajikawa	0.000482	1.97	CG_Melt	Mountain	Dendrites
1989	Kajikawa	0.000528	1.76	CG_Melt	Mountain	Rimed stellar crystals
1989	Kajikawa	0.00083	2.09	CG_Melt	Mountain	Stellar crystals with plates at the ends
1989	Kajikawa	0.00102	2.22	CG_Melt	Mountain	Stellar crystals with spatial dendrites
1990	Mitchell et al.	0.0021	2	CG_Melt	Mountain	Composite from all habits
1993	Detailer et al.	0.00318	1.97	CG_Melt	Mountain	
1995	Brown and Francis	0.00294	1.9	CIS_IWC	Cirrus	Particles g.t. 106 microns
1995	Brown and Francis	0.476	3	CIS_IWC	Cirrus	Particles l.t. 106 microns
1996	Mitchell	0.00027	1.67	CG_Melt	Mountain	Stellar crystals with broad arms
1996	Mitchell	0.000516	1.8	CG_Melt	Mountain	Broadly branched crystals
1996	Mitchell	0.000907	1.74	CIS_Melt	Cirrus	Columns
1996	Mitchell	0.00142	2.02	CG_Melt	Mountain	Dendrites with sector like branches
1996	Mitchell	0.00145	1.8	CG_Melt	Mountain	Rimed long columns
1996	Mitchell	0.00166	1.91	CIS_Melt	Cirrus	Hexagonal columns
1996	Mitchell	0.0028	2.1	CG_Melt	Mountain	Aggregates of side plaes columns and bullet rosettes
1996	Mitchell	0.003	2.3	CG_Melt	Mountain	Densely rimed dendrites
1996	Mitchell	0.00308	2.26	CIS_Melt	Cirrus	Bullet rosettes
1996	Mitchell	0.0033	2.2	CG_Melt	Mountain	Aggregates of side planes
1996	Mitchell	0.00419	2.3	CG_Melt	Mountain	Side planes
1996	Mitchell	0.00583	2.42	CG_Melt	Mountain	Broadly branched crystals
1996	Mitchell	0.00583	2.42	CG_Melt	Mountain	Stellar crystals with broad arms
1996	Mitchell	0.00614	2.42	CG_Melt	Mountain	Dendrites with sector like branches
1996	Mitchell	0.00739	2.45	CG_Melt	Mountain	Hexagonal plates
1996	Mitchell	0.00739	2.45	CIS_Melt	Cirrus	Group of planar crystals

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1996	Mitchell	0.049	2.8	CG_Melt	Mountain	Lump graupel
1996	Mitchell	0.1677	2.91	CIS_Melt	Cirrus	Hexagonal columns
1996	Mitchell	0.466	3	CG_Melt	Convective	Hail l.t. 2.5 cm
2000	Liu and Curry	0.0066	2.21	CIS_Melt	Convective	CEPEX project
2000	Hogan et al.	0.0916	2.34	CIS_IWC	Cirrus	Spherical assumption applied to Brown and Francis
2002	Heymsfield et al.	0.01388	2.54	CIS_IWC	Convective	Bullet rosettes from ARM dataset
2004	Heymsfield et al.	0.0061	2.05	CIS_IWC	Convective	CRYSTAL FACE dataset
2004	Heymsfield et al.	0.0111	2.4	CIS_IWC	Large Scale Ascent	ARM dataset
2007	McFarquhar et al.	0.000675	1.7	CIS_IWC	Large Scale Ascent	Arctic stratus
2007	McFarquhar et al.	0.0007	1.3	CIS_Z	Large Scale Ascent	10-Jun-03
2007	McFarquhar et al.	0.0014	1.3	CIS_Z	Large Scale Ascent	31-May-03
2007	McFarquhar et al.	0.0016	1.2	CIS_Z	Large Scale Ascent	26-Jun-03
2007	McFarquhar et al.	0.0018	1.4	CIS_Z	Large Scale Ascent	2-Jun-03
2007	McFarquhar et al.	0.003	1.8	CIS_Z	Large Scale Ascent	6-Jul-03
2007	McFarquhar et al.	0.0034	1.8	CIS_Z	Large Scale Ascent	24-May-03
2007	McFarquhar et al.	0.0042	2	CIS_Z	Large Scale Ascent	10-Jun-03
2007	McFarquhar et al.	0.0042	1.6	CIS_Z	Large Scale Ascent	29-Jun-03
2007	McFarquhar et al.	0.0049	1.7	CIS_Z	Large Scale Ascent	29-Jun-03
2007	McFarquhar et al.	0.0058	2	CIS_Z	Large Scale Ascent	2-Jun-03
2007	McFarquhar et al.	0.0058	2.1	CIS_Z	Large Scale Ascent	6-Jul-03
2007	McFarquhar et al.	0.0063	2	CIS_Z	Large Scale Ascent	5-Jul-03
2007	McFarquhar et al.	0.0063	2.2	CIS_Z	Large Scale Ascent	6-Jul-03
2007	McFarquhar et al.	0.0064	2	CIS_Z	Large Scale Ascent	3-Jul-03
2007	McFarquhar et al.	0.0076	2.2	CIS_Z	Large Scale Ascent	21-Jun-03
2007	McFarquhar et al.	0.0166	2.2	CIS_Z	Large Scale Ascent	5-Jul-03
2007	Matrosov	0.003	2	SS	None	Aggregates from 0.1 to 2 mm
2007	Matrosov	0.0047	3	SS	None	Aggregates g.t. 20 mm
2007	Matrosov	0.0067	2.5	SS	None	Aggregates from 2 to 20 mm
2010	Schmitt and Heymsfield	0.0028	2.2	FGS	Large Scale Ascent	ARM dataset
2010	Schmitt and Heymsfield	0.0068	2.22	FGS	Convective	CRYSTAL FACE dataset
2010	Heymsfield et al.	0.00359	2.1	FGS	Large Scale Ascent	Warm topped clouds g.t. -25 deg C
2010	Heymsfield et al.	0.00574	2.1	FGS	Large Scale Ascent	Cold topped clouds l.t. -25 deg C
2010	Heymsfield et al.	0.0063	2.1	FGS	Convective	Convectively generated ice clouds
2010	Heymsfield et al.	0.00528	2.1	FGS	Large Scale Ascent	Composite from all environments in Heymsfield et al 2010
2010	Szyrmer and Zawadzki	0.0032	2.07	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.0032	1.85	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00333	1.87	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00343	1.88	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00384	1.9	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.0041	1.91	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00467	1.92	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00499	1.87	CG_Z	Large Scale Ascent	
2010	Szyrmer and Zawadzki	0.00837	1.99	CG_Z	Large Scale Ascent	
2011	Lin and Colle	0.1309	2.88	CIS_IWC	Mountain	Graupel riming fraction of 0.85
2011	Baran et al.	0.04	2	SS	Cirrus	
2013	Cotton et al.	0.0257	2	CIS_IWC	Cirrus	
2014	Fontaine et al.	0.009	2.23	SS	Convective	MT2010 dataset
2014	Fontaine et al.	0.0054	2.05	SS	Convective	MT2011 dataset
2015	Maahn et al.	0.0032	2.23	CIS_Z	Cirrus	ISDAC dataset
2016	Leroy et al.	0.004	2.06	FGS	Convective	Using Dmax size definition
2016	Leroy et al.	0.006	2.15	FGS	Convective	Using Dy size definition
2016	Leroy et al.	0.007	2.18	FGS	Convective	Using Dm size definition
2016	Leroy et al.	0.02	2.51	FGS	Convective	Using Deq size definition
2016	Cazenave et al.	0.006	2.28	SS	Convective	

Year	Author(s)	a (g cm-b)	b	Method [code descriptions below]	Environment	Notes
2016	Cazenave et al.	0.01	2.28	SS	Convective	
2016	Cazenave et al.	0.015	2.28	SS	Convective	
2016	Olson et al.	0.0082	2.14	SS	Convective	MC3E dataset
2017	Xu and Mace	0.00687	2.3	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00754	2.3	CIS_IWC	Cirrus	
2017	Xu and Mace	0.0035	2.2	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00387	2.17	CIS_IWC	Cirrus	
2017	Xu and Mace	0.0022	2.04	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00536	2.28	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00426	2.28	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00294	2.24	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00172	2.13	CIS_IWC	Cirrus	
2017	Xu and Mace	0.00735	2.29	CIS_IWC	Cirrus	
2017	Erfani and Mitchell	0.001263	1.91	CG_Melt	Mountain	Unrimed dendrites from Mitchell 1990
2017	Erfani and Mitchell	0.001988	1.78	CG_Melt	Mountain	Rimed dendrites from Mitchell 1990
2017	Erfani and Mitchell	0.000939	1.79	CG_Melt	Mountain	Rimed dendrites ignoring largest particles from Mitchell 1990

FGS	Fractal geometry simulations
CG_Z	Collected at ground and constrained by Z
CG_Melt	Collected at ground and weighed by melting
CIS_IWC	Collected in-situ and constrained by IWC
CIS_Z	Collected in-situ and constrained by Z
CIS_Melt	Collected in-situ and weighed by melting
SS	Scattering simulations constrained by Z