

Table DR1. Coeval late Paleoproterozoic and Mesoproterozoic palaeomagnetic poles from Baltica (Fennoscandia) and Laurentia.

Rock name	Age	Plat	Plong	A ₉₅	Reference
	(Ma)	(°N)	(°E)	(°)	
<i>Fennoscandia</i>					
Shoksha Formation	1790-1770	39.7	221.1	4.0	Pisarevsky and Sokolov (2001)
Mean for Baltica	~1460	15.0	181.0	11.0	Salminen and Pesonen (2007)
Mean for Baltica	~1265	4.0	158.0	4.0	Pesonen et al. (2003)
Salla Dyke	1122±7	71.0	113.0	8.1	Salminen et al. (2009)
Laanila Dolerite	1045±50	-2.0	212.0	15.0	Mertanen et al.(1996)
<i>Laurentia</i>					
Mean for Laurentia	1760-1740	20.8	265.5	5.2	Irving et al. (2004)
St. Francois Mts.	1476±16	-13.2	219.0	6.1	Meert and Stuckey (2002)
Michikamau Intr.	1460±5	-1.5	217.5	4.7	Emslie et. al. (1976)
Harp Lake Complex	1450±5	1.6	206.3	4.3	Irving et al. (1977)
MacKenzie dykes	1267+7/-3	4.0	190.0	5.0	Buchan and Halls (1990), LeCheminant and Heaman (1989)
Freda Sandstone	1050±30	2.0	179.0	4.0	Henry et al. (1977), Wingate et al.(2002)
Nonesuch Shale	1050±30	8.0	178.0	4.0	Henry et al. (1977), Wingate et al.(2002)

Plat, Plong = latitude and longitude of the paleomagnetic pole; A₉₅ = semi-angle of the 95% cone of confidence.

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Figure DR1.

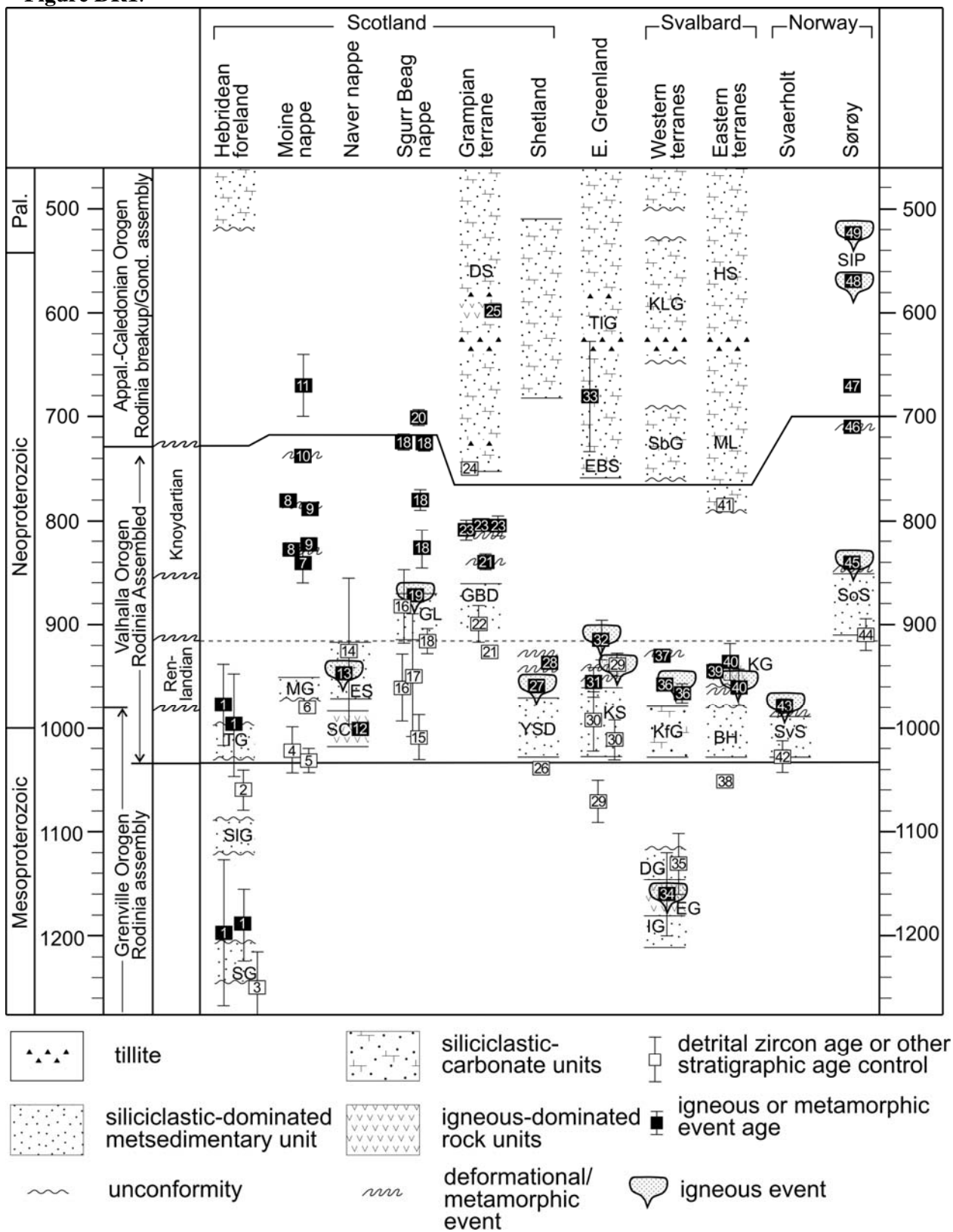


Figure DR1. Age range of principal late Mesoproterozoic to Paleozoic metasedimentary units and of tectonothermal events within regions affected by the Valhalla Orogen, from the North Atlantic borderlands. Numbers on data points refer to the following sources: **1** - Turnbull et al. (1996) determined a maximum age for the Stoer Group by a Rb–Sr age of 1187 ± 35 Ma on chloritized biotite from a gneissic boulder and a Pb–Pb age of 1199 ± 70 Ma on a thin stromatolitic bed low in the group interpreted as a depositional age and maximum ages for the Torridon Group of 994 ± 48 and 977 ± 39 based on Rb/Sr analysis of shales; **2** - Rainbird et al. (2001), U–Pb zircon age of 1060 ± 18 Ma for youngest detrital grain in Torridon Group; **3** - Kinnaird et al. (2007), U–Pb zircon age of 1247 ± 34 Ma for youngest detrital grain in Sleat Group, the age of which is also constrained by its unconformable relationship with the overlying Torridon Group and inferred younger age than the Stoer Group; **4** - Kirkland et al. (2008), U–Pb zircon age of 1022 ± 24 Ma for youngest detrital grain in Morar Group, Moine Nappe; **5** - Friend et al. (2003), U–Pb zircon age of 1032 ± 12 Ma for youngest detrital grain in Morar Group, Moine Nappe; **6** - Peters (2001) – U–Pb zircon age of 980 ± 4 Ma for youngest detrital grain in Morar Group, Moine Nappe; **7** - Kirkland et al. (2008), U–Pb magmatic zircon overgrowth age of 842 ± 20 Ma on detrital Morar Group zircon, Moine Nappe; **8** - Rogers et al. (1998) U–Pb monazite ages of 827 ± 2 and 781 ± 1 Ma for the syn-metamorphic Ardnish and Sgurr Breac pegmatites intrusive into Morar Group; **9** - Vance et al. (1998), Sm–Nd garnet-whole rock ages of 823 ± 5 Ma and 788 ± 4 Ma for growth zones in garnet from the Morar Group; **10** - Tanner and Evans (2003), U–Pb titanite age from calc-silicate pod in Morar Group, Moine Nappe; **11** - Storey et al. (2004), U–Pb titanite age of 669 ± 31 Ma occurring within, and inferred to date, a shear zone between eastern and western units of the Glenelg-Attadale Inlier, which also contains Morar Group rocks; **12** - Burns et al. (2004), Nd depleted mantle model age of around 1000 Ma for the Strathy Complex, possible basement assemblage to the East Sunderland Moine succession in the Naver Nappe; **13** - Kinny and Strachan (unpublished data), U–Pb zircon age of *c.* 965 Ma for protolith to grey granitic gneisses; **14** - Friend et al. (2003), U–Pb zircon age of 926 ± 68 Ma for youngest detrital grain from within the Kirtomy migmatites in East Sunderland Moine succession, Naver Nappe; **15** - Kirkland et al. (2008), U–Pb zircon age of 1009 ± 22 Ma for youngest detrital grain in sample of Glenfinnan Group, Sgurr Beag Nappe; **16** - Cawood et al. (2004), U–Pb zircon age of 962 ± 32 Ma for the average of four analyses from youngest detrital grain in sample of Loch Eil Group, and U–Pb zircon age of 883 ± 35 Ma for the average of two analyses from youngest detrital grain in sample of Glen Urquhart psammite, Sgurr Beag Nappe; **17** - Friend et al. (2003), U–Pb zircon age of 947 ± 59 Ma for youngest detrital grain in sample of granite gneiss incorporating metasediments of the Glenfinnan Group, Sgurr Beag Nappe; **18** - Emery (2005) and Cutts, Kinny, Strachan, Hand, Kelsey, Emery, Friend, & Leslie (unpublished data) U–Pb zircon age of 917 ± 13 Ma for youngest detrital grain from sample of Glenfinnan Group, Sgurr Beag Nappe and U–Pb zircon age of 725 ± 4 Ma and ICP-MS monazite ages of 825 ± 18 Ma, 782 ± 11 Ma and 724 ± 6 Ma for monazite from migmatites within the Glenfinnan Group, Sgurr Beag Nappe; **19** - U–Pb zircon ages of felsic and mafic igneous bodies emplaced into the Glenfinnan and Loch Eil groups of the Sgurr Beag Nappe give ages of 873 ± 7 Ma for the Ardgour Granite Gneiss (Friend et al., 1997), 873 ± 6 Ma for mafic sheets (Millar, 1999), and 870 ± 20 Ma for the Fort Augustus Granite Gneiss (Rogers et al., 2001); **20** - Cawood, Kinny, Strachan and Loewy (unpublished data), U–Pb zircon age on high-U rims of the Glen Doe Granite Gneiss yield an age of *c.* 700 Ma; **21** - Highton et al. (1999), U–Pb zircon ages of 926 ± 6 Ma for youngest detrital grain and 840 ± 11 Ma for melt crystallization and new zircon growth in sample of Dava succession from within Grampian Shear Zone. The succession is part of the sub-Grampian basement to the Dalradian Supergroup and inferred to be an equivalent to the Moine succession (Piasecki, 1980); **22** - Cawood et al. (2003), U–Pb zircon age of 900 ± 17

Ma for youngest detrital grain from sample of Glen Banchor succession, which is part of the sub-Grampian basement to the Dalradian Supergroup and inferred to be an equivalent to the Moine succession; **23** – Noble et al. (1996), U–Pb monazite ages of 806 ± 3 Ma, $808 +11/-9$ Ma and $804 +13/-12$ Ma for pegmatites and mylonitic rocks from the Grampian Shear Zone separating sub-Grampian basement and Dalradian Supergroup; **24** – approximate age of 750 Ma based on Rb/Sr ages of muscovites in pegmatites from sub-Grampian basement to the Dalradian Supergroup (Piasecki and van Breemen, 1983, and references therein); **25** – Halliday et al. (1989) and Dempster et al. (2002) have determined U–Pb zircon ages for the Tayvallich Volcanics and inferred comagmatic intrusive rocks of around 600–595 Ma; **26** – Cutts et al. (in press), mean U–Pb zircon age of c. 1030 Ma for youngest grains from sample of Westing Group, Shetland Islands; **27** – Kinny and Strachan (unpublished data), U–Pb zircon age for amphibolites and granites within the Yell Sound Division, Shetland Islands; **28** – Cutts et al. (in press), U–Pb zircon and monazite ages of c. 950–930 Ma determined from the Westing Group, Shetland Islands, and thought to date high-grade metamorphism; **29** – Watt et al. (2000), U–Pb zircon age of 1072 ± 21 Ma for youngest detrital grain from sample of Krummedal succession. East Greenland and 938 ± 13 Ma for undeformed porphyritic granite intruding Stauning Alper migmatite zone (Krummedal succession equivalent); **30** – Kalsbeek et al. (2000), U–Pb zircon ages of 1012 ± 17 Ma and 994 ± 30 Ma for youngest detrital grains from sample of Krummedal succession, which is intruded by anatectic granites at 947 ± 19 Ma, 942 ± 20 Ma, 939 ± 21 Ma, 935 ± 9 Ma, 927 ± 65 Ma, 921 ± 8 Ma, 919 ± 14 Ma; **31** – Strachan et al. (1995), mean U–Pb zircon age of 955 ± 13 Ma for 6 analyses from metasedimentary gneiss (Krummedal succession equivalent) from Smallefjord, NE Greenland, related to high grade metamorphism of gneiss. Youngest detrital grain from sample is 1029 ± 17 Ma; **32** – Leslie and Nutman (2003), U–Pb zircon age of 915 ± 18 Ma for augen granite which cuts folded Krummedal succession metasediments, Renland, East Greenland; **33** – Jensen (1993) Pb–Pb age of 680 ± 65 Ma on Cu ore stratiform deposit within Eleonore Bay Supergroup. An older age for the Eleonore Bay Supergroup is provided by detrital zircons as young as 987 ± 18 Ma (Dhuime et al., 2007) and the presence of acritarchs which are no older than earliest Neoproterozoic according to Vidal (1976); **34** – Balashov et al. (1996), consistent set of U–Pb zircon evaporation ages of 1160 ± 40 Ma for mafic and felsic igneous rocks of the Eimfjellet Group, which separates metasedimentary rocks of the underlying Isbjørnhamma and overlying Deilegga groups, Southwestern terranes, Svalbard; **35** – Pettersson et al. (2009), U–Pb age of 1131 ± 18 Ma for youngest detrital zircon in paragneiss of the Smeerenburgfjorden Complex, a migmatitic equivalent of the Krossfjorden Group, part of the Northwestern terranes of Svalbard, an inferred correlative of the Brennevinsfjorden-Helvetesflya metasedimentary units from the Eastern terranes (NE Svalbard) and the Krummedal sequence of Greenland; **36** – Balashov et al. (1995), U–Pb zircon lower intercept age of c. 930 on volcanic rocks, interpreted as related to regional metamorphism, Southwestern terranes, Svalbard; **37** – Pettersson et al. (2009), U–Pb zircon ages of 965.8 ± 10 Ma, 958.6 ± 5 Ma and 956.1 ± 5.6 Ma for orthogneisses and orthogneiss xenolith in contact with metasedimentary rocks correlated with the Krossfjorden Group, Northwestern terranes of Svalbard; **38** – A.N. Larionov, unpub. data in Johansson et al. (2005), detrital zircon ages as young as ~ 1050 Ma in the Brennevinsfjorden Group, Eastern terranes, Svalbard; **39** – Johansson et al. (2000) Kapp Hansteen Group volcanics (and equivalents) unconformably overlie the Brennevinsfjorden Group and yield U–Pb ages of 963 ± 5 Ma, 958 ± 10 Ma, 958 ± 4 Ma, 950 ± 10 Ma and 946 ± 7 Ma; **40** – augen granites intruding the Brennevinsfjorden and Kapp Hansteen groups yield U–Pb ages in the range 961 ± 17 Ma and 939 ± 8 Ma Group (Gee et al., 1995; see also Johansson et al., 2004; Johansson et al., 2000). **41** – Knoll (1982) has recovered acritarchs from the Murchisonfjorden and Lomfjorden successions suggest an age extending back to the mid-Neoproterozoic (c. 800

Ma); **42** – Kirkland et al. (2007), U–Pb zircon age of 1027 ± 16 Ma for youngest detrital grain from sample of Svaerholt succession, lower nappes of the Kalak Nappe Complex, Norway; **43** – Kirkland et al. (2006), U–Pb zircon age of 978 ± 9 Ma for Hårvika granite, which cuts deformed metasedimentary rocks of the Svaerholt succession, lower nappes of the Kalak Nappe Complex, Norway; **44** – Kirkland et al. (2007), U–Pb zircon age of 910 ± 15 Ma for youngest detrital grain from sample of Sørøy succession, upper nappes of the Kalak Nappe Complex, Norway; **45** – Kirkland et al. (2006), U–Pb zircon age of 841 ± 6 Ma for Litlefjord granite, which cuts deformed metasedimentary rocks of the Sørøy succession, upper nappes of the Kalak Nappe Complex, Norway; **46** – Kirkland et al. (2006), U–Pb zircon age of 709 ± 4 Ma for syn-deformational leucosome in Eidvågeid Paragneiss, upper nappes of the Kalak Nappe Complex, Norway, with deformation related to the Snøfjord event; **47** – Kirkland et al. (2007), U–Pb age of 672 ± 6 Ma for zircon overgrowths in paragneiss from Sørøy succession, upper nappes of the Kalak Nappe Complex, Norway. This is similar to a 668 ± 68 Ma Nd–Sm isochron age for plutons from the Seiland Igneous Province (Daly et al., 1991); **48** – Roberts et al. (2006), U–Pb zircon ages for intrusions of the Seiland Igneous Province, which intrudes the Sørøy succession of the Kalak Nappe Complex, Norway, range from 571 ± 4 Ma to 562 ± 6 Ma; **49** – Pedersen et al. (1989), U–Pb zircon ages of 531 ± 2 Ma and 523 ± 2 Ma for nepheline syenite pegmatite intrusions associated with the latter phases of the Seiland Igneous Province, Norway.

Abbreviations:

BH – Brennevinsfjorden Group and Helvetesflya Formation
 DG – Deilegga Group
 DS – Dalradian Supergroup
 EBS – Eleonore Bay Supergroup
 EG – Eimfjellet Group
 ES – East Sunderland Moine succession
 GBD – Glen Banchor and Dava successions, sub-Grampian basement
 GL – Glenfinnan and Loch Eil Groups, including Glen Urquhart psammite
 HS – Hinlopenstretet Supergroup
 IG – Isbjørnhamma Group
 KfG – Krossfjorden Group
 KG – Kapp Hansteen Group
 KLG – Kapp Lyell Group
 KS – Krummedal succession
 MG – Morar Group
 ML – Murchisonfjorden and Lomfjorden successions
 Pal. - Paleozoic
 SbG – Sofiebogen Group
 SC – Strathy Complex
 SG – Stoer Group
 SIP – Seiland Igneous Province
 SIG – Sleat Group
 SoS – Sørøy succession, Kalak Nappe Complex
 SvS – Svaerholt succession, Kalak Nappe Complex
 TG – Torridon Group
 TIG – Tillite Group
 YSD – Yell Sound Division – Westing Group

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