DATA REPOSITORY ITEM

Figure DR1. Late Carboniferous–Early Permian palaeomagnetic poles

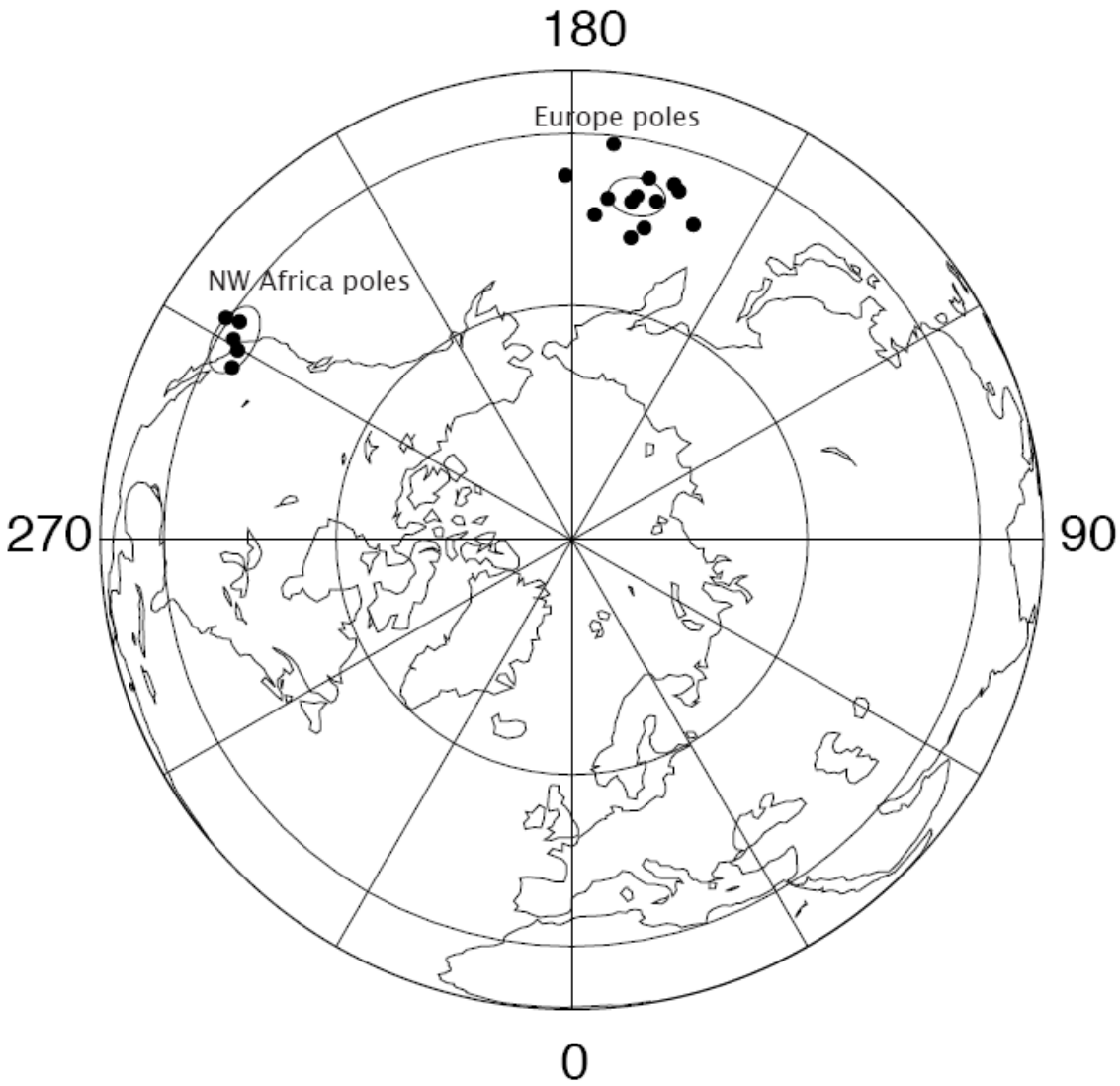
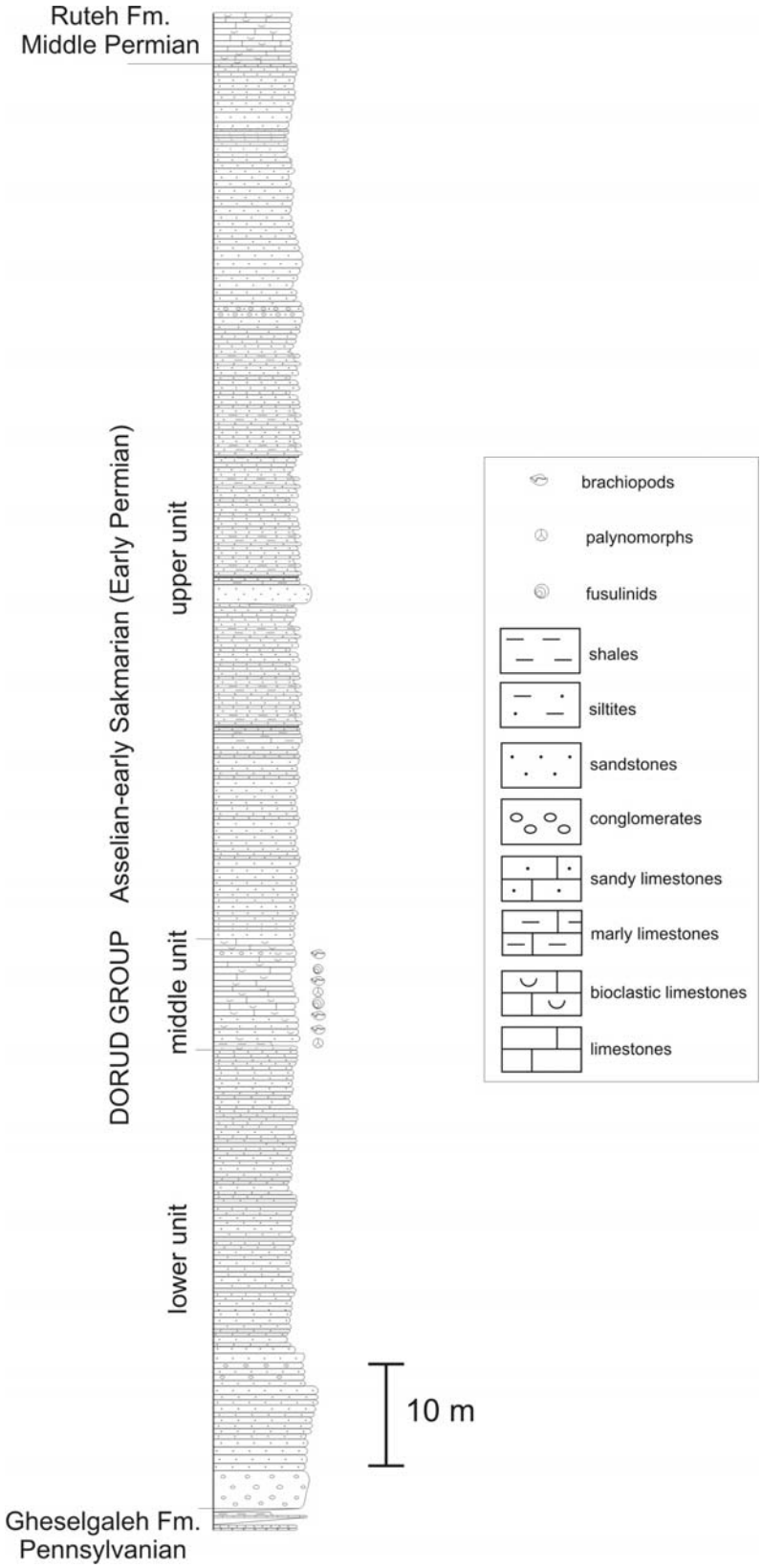


Table DR1. Late Carboniferous–Early Permian (~315–285 Ma) paleomagnetic poles

Rockname and Locality	Long (°E)	Lat (°N)	Ref.
Europe:			
Stabben Island Syenite, Norway	174.0	32.0	1
Skaane Quartz-dolerites, Sweden	168.0	38.0	1
Gzhelian Stage Seds., Russia	170.0	43.0	3
Donbass arauc. & Avilov, Ukraine	176.0	46.0	3
Westph./Steph. Redbeds, Czech.	163.0	39.0	4
Westph./Steph. Volcanics, Poland	174.0	43.0	5
Sarna Alkaline Intrusion, Sweden	164.0	38.0	6
Sudetic Mnt. Granitoid, Poland	166.0	42.0	7
Great Whin Sill, UK	159.0	44.0	8
Wackerfield Dike, UK	169.0	49.0	9
Sudetic Mnts., Poland	181.0	39.0	10
Mauchline Lavas, Scotland	167.0	47.0	11
Overall mean paleomagnetic pole for Europe:			
N=12, K=151, A95=3.5°, Long=169.3°E, Lat=41.8°N			
NW Africa:			
Merkala	236.6	32.4	12
Tiguentourine	240.3	35.3	12
Abadla-Mezarif combined	237.2	29.2	13
Auernig	243.0	36.0	14
Overall mean paleomagnetic pole for NW Africa:			
N=4, K=418, A95=4.5°, Long=239.2°E, Lat=33.3°N			

Rockname and Locality = name and locality of sampled rock unit; Long = paleomagnetic pole longitude (°E); Lat = paleomagnetic pole latitude (°N); Ref. = reference: 1. Sturt, B. A. & Torsvik, T. H. A late Carboniferous palaeomagnetic pole recorded from a syenite sill, Stabben, Central Norway. Physics of the Earth and Planetary Interiors 49, 350-359 (1987). 2. Bylund, G. Paleomagnetism of dykes along the southern margin of the Baltic Shield. Geol. Foreningens I Stockholm Forhandl 96, 231-235 (1974). 3. Irving, E., Tanczyk, J. & Hastie, J. Catalogue of Paleomagnetic Directions and Poles, 3rd issue, Paleozoic results 1949–1975. Geomagn. Ser. 5, 99 pp. Ottawa: geomagn. Serv. Canada (1976). 4. Krs, M. in 13th Intern. Geol. Congress 87–96 (Prague, 1968). 5. Birkenmajer, K., Grocholski, A., Milewicz, J. & Nairn, A. E. M. Paleomagnetic studies of Polish rocks, 2. The Upper Carboniferous and Lower Permian of the Sudetes. Ann. Geol. Pologne 38, 435–474 (1968). 6. Smith, R. L. & Piper, J. D. A. Paleomagnetism of the Sarna alkaline body. Geol. Foreningens i Stockholm Forhandl 101, 167–168 (1979). 7. Halvorsen, E., Lewandowski, M. & Jelenska, M. Palaeomagnetism of the Upper Carboniferous Strzegom and Karkonosze granites and the Kudowa Granitoid from the Sudet Mountains, Poland. Physics of the Earth and Planetary Interiors 55, 54-64 (1989). 8. Storetvedt, K. M. & Gidskehaug, A. The magnetization of the Great Whin Sill, northern England. Physics of the Earth and Planetary Interiors 2, 105–111 (1969). 9. Tarling, D. H., Mitchell, J. G. & Spall, H. A paleomagnetic and isotopic age for the Wackerfield dyke of northern England. Earth and Planetary Science Letters 18, 427–432 (1973). 10. Westphal, M., Edel, J. B., Kadzialko-Hofmokl, M., Jelenska, M. & Grocholski, A. Paleomagnetic study of Upper Carboniferous volcanics from Sudetes (Poland). J. Geophys. 61, 90–96 (1987). 11. Harcombe-Smee, B. J., Piper, J. D. A., Rolph, T. C. & Thomas, D. N. A palaeomagnetic and palaeointensity study of the Mauchline lavas, south-west Scotland. Phys. Earth Planet. Int. 94, 63–73 (1996). 12. Derder, M. E. M. et al. New African Lower Carboniferous paleomagnetic pole from intrusive rocks of the Tin Serririne basin (Southern border of the Hoggar, Algeria). Tectonophysics 418, 189–203 (2006). 13. Merabet, N., Henry, B., Kherroubi, A. & Maouche, S. Autunian age constrained by fold test for paleomagnetic data from the Mezarif and Abadla basins (Algeria). Journal of African Earth Sciences 43, 556–566 (2005). 14. Manzoni, M., Venturini, C. & Vigliotti, L. Paleomagnetism of Upper Carboniferous limestones from the Carnic Alps. Tectonophysics 165, 73-80 (1989).

Figure DR2. Stratigraphic log of the Dorud Group



Stratigraphic log of the Dorud type section in the Shemshak Valley (Alborz Mountains, N Iran) N36°00'18.3'' E51°29'01.6''. The Dorud Group of Early Permian age overlies the Pennsylvanian Gheselgaleh Formation and it is overlain by the Middle Permian Ruteh Formation.

List of brachiopod species and palynomorphs from the Asselian-early Sakmarian Dorud Group (Angiolini and Stephenson, 2007):

Derbyiidae gen. et sp. ind.,
Neochonetes (Neochonetes) sp.
Costispinifera sp.
Reticulatia uralica (Tschernyschew, 1902)
Calliprotonia sp.
Juresania dorudensis Fantini Sestini, 1965
Linoproductus dorotheevi (Fredericks, 1932)
Cancrinella cancriniformis (Tschernyschew, 1889)
Linoproductidae gen. et sp.
Acosarina aff. *juresanensis* (Tschernyschew, 1902)
Larispirifer fantinisestinii Angiolini & Stephenson, 2007
Alisporites indarraensis Segroves, 1969
?*Barakarites* sp.
Cannanoropollis bilateralis (Tiwari) Lindström, 1995
?*Complexisporites* sp.
Corisaccites alutas Venkatachala & Kar, 1966
Diexallophasis sp.
Hamiapollenites fusiformis Marques-Toigo, 1974
Limitisporites sp.
?Kingiacolpites subcircularis Tiwari & Moiz, 1971
Plicatipollenites malabarensis (Potonié & Sah) Foster, 1975
Potonieisporites cf. *brasiliensis* (Nahuys, Alpern & Ybert) Archangelsky & Gamerro, 1979
Potonieisporites novicus Bharadwaj, 1954
Protohaploxypinus amplus (Balme & Hennelly) Hart, 1964
Protohaploxypinus limpidus (Balme & Hennelly) Balme & Playford, 1967
Striasulcites tectus Venkatachala & Kar, 1968
Striatopodocarpites spp.
Sulcatisporites ovatus (Balme & Hennelly) Bharadwaj, 1962
Veryhachium trispinosum (Eisenack) Stockmans & Willière, 1962
Vesicaspora spp.
Vittatina costabilis Wilson, 1962

Table DR2. Data matrix showing brachiopod genera distribution from 10 operational geographic units. Brachiopod data from Tschernyschew (1902), Kalashnikov (1988), Shi and Waterhouse (1996), Shen et al. (2000), Angiolini et al. (2005), Angiolini and Stephenson (2007).

Brachiopod genera	Central Afghanistan	Karakoram	India	Baoshan	Thailand	Western Australia	Eastern Australia	Iran	Yukon	Urals
Arctitreta	0	0	1	0	1	0	0	0	1	0
Streptorhynchus	1	1	0	0	0	0	0	0	0	0
Kiangsiella	0	1	0	0	0	1	0	0	0	0
Bandoproductus	0	1	1	1	1	0	1	0	0	0
Lyonia	0	1	0	0	0	1	1	0	0	0
Trigonotreta	1	1	1	1	0	1	1	0	0	0
Punctospirifer	1	1	0	0	0	0	0	0	0	0
Spiriferellina	1	0	0	0	0	0	0	0	1	0
Cyrtella	1	1	0	1	0	1	0	0	0	0
Dielasma	1	1	0	1	0	0	0	0	1	0
Elasmata	0	0	0	0	1	0	0	0	0	0
Spirelytha	0	1	0	1	1	0	0	0	1	0
Rhynchopora	0	1	0	0	1	1	0	0	1	1
Tomiopsis	1	1	1	0	0	1	0	0	1	0
Sulciplica	0	0	0	0	1	0	0	0	0	0
Comuquia	0	0	0	0	1	0	0	0	0	0
Costatumulus	0	0	0	1	0	0	0	0	0	0
Marginifera	0	0	0	1	0	0	0	0	0	1
Cimmeriella	0	0	0	1	0	0	0	0	0	0
Lamniplica	0	0	0	0	1	0	0	0	0	0
Cleiothyridina	0	0	1	0	0	0	0	0	0	0
Orthotichia	0	0	0	1	0	0	0	0	1	1
Grumantia	0	0	0	0	0	1	0	0	0	0
Orbiculoidea	0	0	0	0	0	0	0	0	1	0
Orthotetes	0	0	0	0	0	0	0	0	1	0
Komiella	0	0	0	0	0	0	0	0	1	0
Dyros	0	0	0	0	0	0	0	0	1	1
Fimbrinia	0	0	0	0	0	0	0	0	1	0
Krotovia	0	0	0	0	0	0	0	0	1	1
Tubersulcus	0	0	0	0	0	0	0	0	1	0
Kozlowskia	0	0	0	0	0	0	0	0	1	1
Liosotella	0	0	0	0	0	0	0	0	1	0
Anemonaria	0	0	0	0	0	0	0	0	1	0
Rugivestis	0	0	0	0	0	0	0	0	1	1
Costispinifera	0	0	0	0	0	0	0	1	1	1
Kutorginella	0	0	0	0	0	0	0	0	1	0
Thamnosia	0	0	0	0	0	0	0	0	1	0
Waagenoconcha	0	0	0	0	0	0	0	0	1	1
Kochiproductus	0	0	0	0	0	0	0	0	1	1
Reticulatia	0	0	0	0	0	0	0	1	1	1
Calliprotonia	0	0	0	0	0	0	0	1	1	1
Chaoiella	0	0	0	0	0	0	0	0	1	1
Antiquatonia	0	0	0	0	0	0	0	0	1	0
Sowerbina	0	0	0	0	0	0	0	0	1	0
Protoanidanthus	0	0	0	0	0	0	0	0	1	0
Linoproductus	0	0	0	0	0	0	0	1	1	1
Globiella	0	0	0	0	0	0	0	1	1	1
Cancrinella	0	0	0	0	0	0	0	1	1	1
Yakovlevia	0	0	0	0	0	0	0	0	1	1
Rhynoleichus	0	0	0	0	0	0	0	0	1	0
Stenoscisma	0	0	0	0	0	0	0	0	1	1
Composita	0	0	0	0	0	0	0	0	1	0
Hustedia	0	0	0	0	0	0	0	0	1	1
Yukonospirifer	0	0	0	0	0	0	0	0	1	0
Spiriferella	0	0	0	0	0	0	0	0	1	1
Alispiriferella	0	0	0	0	0	0	0	0	1	0
Neospirifer	0	0	0	0	0	0	0	0	1	0
Domokhotia	0	0	0	0	0	0	0	0	1	0
Larispirifer	0	0	0	0	0	0	0	1	1	1
Camerisma	0	0	0	0	0	0	0	0	1	1
Tiramnia	0	0	0	0	0	0	0	0	1	1
Derbyia	0	0	0	0	0	0	0	1	0	1
Chonetinella	0	0	0	0	0	0	0	0	0	1
Avonia	0	0	0	0	0	0	0	0	0	1
Juresania	0	0	0	0	0	0	0	1	0	1
Brachythyris	0	0	0	0	0	0	0	0	1	1
Urushtenia	0	0	0	0	0	0	0	0	0	1
Rostranteris	0	0	0	0	0	0	0	0	0	1
Septacamera	0	0	0	0	0	0	0	0	0	1
Acosarina	0	0	0	0	0	0	0	1	0	1
N. (Neochonetes)	0	0	0	0	0	0	0	1	0	1

References for Table DR2

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