

PERMIAN PHOSPHORITE PROVINCES AND THEIR DIVERSE PALEOCEANOGRAPHIC SETTINGS

ZIEGLER, A.M. and GOLDBERG, K. Department of the Geophysical Sciences,
The University of Chicago, U.S.A.

Seven Permian phosphorite provinces are defined to include broad regions with multiple localities of bedded phosphorite, usually in association with other indicators of high biologic productivity. The Western North American Shelf Margin Province is seen in the classical Phosphoria Fm. of western U.S.A. Cherts and oil source rocks are present and this province clearly represents the west coast upwelling situation. The Ural Foreland Basin Province is juxtaposed between the converging orogen to the east and a line of reefs to the west. The presence of reefs seems inconsistent with an upwelling interpretation. The South China Platform Sea Province was regionally intermediate between coastal coals and basinal oil source rocks. The equatorial setting suggests high rainfall and a stratified water column. The South Africa Karoo Basin Province is associated with the top of the Dwyka Tillite and the overlying marine shales with dropstones and chert layers. This is probably an example of ice edge upwelling. The Peninsular India Trough Province phosphorites accumulated during times when coal forming conditions were replaced by the penetration of brackish conditions along narrow troughs. These conditions evidently represent estuarine productivity. The Himalaya Shelf Margin Province phosphorites may represent starvation and drowning of the margin, rather than enhanced productivity. Finally, the Western Australia Marginal Basin Province contains scattered phosphorites and oil source rocks. Our climate model results suggest upwelling along this coast. So, the seven defined phosphorite provinces represent diverse oceanographic settings, including high and low latitude, shelf margin and narrow basin, and normal and low salinities.