Rare earth element and Nd-isotopes of the Gulf of Alaska (North Pacific)

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We present rare earth element (REE) and Nd-isotopic data collected from the Gulf of Alaska in the summer of 2007. Surface water samples were collected from near-coastal sites in transects along the Alaskan coast, and also in transects from near-coastal to the open ocean. Two depth profiles at the deeper sites were also measured. The coastal transects, representing a wide range in salinity, are used to define the end-member of the erosion products from Alaskan sources. The input of REEs (and Nd-isotopes) to the coastal surface waters reflects the dominantly accretionary terraines eroded by both the smaller coastal-run rivers and the large Alaskan glaciers (the Malaspina glacier is ~3,900 km^2). Although the bedrock is consequently diverse, systematic variations can be found in the coastal transect REE/Nd-isotopic data that reflects the sedimentary sources. The coastal-open ocean transects crossed large eddies that are thought to deliver iron to the otherwise HNLC regions in this N. Pacific region. Indeed, iron and surface ocean productivity varied significantly across these eddies. The Nd-isotopic data is used in an attempt to fingerprint the origin of these eddies, through comparison with the coastal transect data (i.e. the potential source regions). The REE data is also shown to vary across the eddies, and may indicate that there are significant controls of biology over REE distributions in the oceans. Finally, the depth profiles provide the first such data from the far north Pacific, data that is useful for "ground-truthing" and modeling Nd-isotopes and REEs, especially in light of their growing application as paleoproxies.

The early years of thermochronology: The remarkable contributions of Derek York

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In addition to being a remarkable speaker, teacher and writer, the late Derek York made many original contributions to the field of geochronology in general and Ar dating in particular. It could be argued that not only did York teach the world how to draw a proper line, but that many aspects of modern Ar dating were pioneered in his Toronto lab. One of York's most enduring contributions was to popularize the use of the famous Dodson equation [1] that greatly broadened our views on what it means to "date" a rock. He realized that, in principle, it was possible to derive all of the required Ar kinematics data needed by the equation from a standard $^{40}Ar/^{39}Ar$ analysis and that the age that resulted could be assigned to a blocking temperature [2, 3]. Much of the early work in this area was with Glenn Berger and it concentrated on unravelling the complex thermal history of the Grenville Province in southern Ontario. Although the original approach has fallen out of favor, at least for hydrous minerals, much of the original cooling history of the Grenville has been largely confirmed by later studies.

York was keenly aware of the importance of temperature-time curves to the construction of Precambrian polar wander paths and he promoted the idea that commonly used minerals for Ar dating straddle the typical blocking temperatures in thermo-remanent magnetization. In fact, York even extended the theory of Dodson's blocking temperatures to the formalism of rock magnetism [4]. At Toronto, I worked with York on many theoretical and interpretational problems dealing with the impact of complex thermal histories on Ar age spectra [5,6]. Many of the currently debated concepts of non-uniqueness of thermal histories were in fact at least partially explored long ago and it is with some nostalgia that I note these debates along with current work in the field of U-Th-He dating. All of these research efforts owe much to the work of Derek York.

[1] Dodson (1973) *Contrib. Mineral. Petrol.* **40**, 259-274. [2] Buchan *et al.* (1977) *J. Geomagn. Geoelectr.* **29**, 401-410. [3] Berger & York (1981) *Geochim. Cosmochim. Acta* **45,** 795-811. [4] York (1978) *Earth Planet. Sci. Lett.,* **39** 94-97. [5] York (1984) *Ann. Rev. Earth Sci.* **12,** 384-409. [6] Onstott *et al.* (1984) *Bull. Geol. Soc. Am.* **95,** 1045-1054.