Multi-isotope investigation to identify general characteristics of different cold vent systems

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Pore waters from diverse cold vent systems of different geological regimes such as the Black Sea, the Nile Delta, the Gulf of Cadiz, and off Costa Rica were investigated with respect to their stable oxygen, hydrogen, chlorine, and radiogenic strontium isotopic as well as their chemical composition.

The fluids of cold vent systems may carry valuable information about the source strata and temperature, the diagenetic evolution, and the contribution of brine and gas hydrate. To unravel the mélange of information combined in the pore fluid it is essential to apply geochemical isotope and/or element correlations that indicate clear trends. Such a correlation is given by the $\delta^{18}O$ versus Na/Cl ratio, which combines information on mineral hydration and dehydration processes (light/heavy $\delta^{18}O$) and interaction with relictic brines or dissolution of evaporites. An important process of mineral dehydration is the smectite to illite transformation, which can be tracked by decreasing chlorine isotope and concentration values and a negative correlation of $\delta^{18}O$ versus $\delta^{2}H$ values. The most intense mineral dissolution and transformation processes are observed at the Nile Delta sites and some of the Black Sea and Gulf of Cadiz sites. In addition, $^{87}Sr/^{86}Sr$ ratios and Sr concentrations provide valuable information on the primary source of the fluid and its secondary diagenetic overprinting by alteration of crustal rocks and sediments in general.

Since the information from cold seep fluids is manifold, it is essential to evaluate different isotopic proxies to decipher the specific characteristics of a cold vent system. We will present systematic compilations of isotope data from locations covering a variety of different geological and tectonic settings and discuss the underlying trends and processes in detail.

Aerosol indirect effects from satellite: Skeptics vs. optimists

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The skeptics argue that satellite observations alone will not produce progress in understanding aerosol-cloud processes. Cloud condensation nuclei (CCN) are too small to be resolved from remote sensing. Chemical composition cannot be determined. Local updraft velocities in the cloud are not measured from space. Furthermore, aerosol retrievals in the vicinity of clouds are rife with problems. Finally, all those studies showing varying cloud properties as a function of aerosol optical depth are inherently limited – merely suggestive. From the most skeptical viewpoint, why bother?

On the other hand, the optimists show robust relationships between aerosol and cloud variables. These satellite studies have brought new understanding to aerosol-cloud interaction from the ship track images, through the relationships between cloud microphysics and aerosol optical depth, to opening our eyes to the broad implications of aerosol relationships with cloud fraction. Satellites offer a broad view of cloud and aerosol fields, and are exceedingly helpful in developing a conceptual understanding of how aerosols can affect clouds on regional to global scales. From the optimistic viewpoint, how can we ignore these data?

The key to using satellite data to answer scientific questions about cloud aerosol interaction requires a clear understanding of both the skeptical and optimistic viewpoints. Use the data. Know the limitations, and never forget the integral role of in situ data and models in interpreting the satellite observations, and establishing causality.