

Modelling fluid flow in the Mid Oceanic Ridge hydrothermal system

The natural laboratory of Mid Oceanic Ridge (MOR) hydrothermal system constitutes a complex fluid-circulation system within the oceanic lithosphere. Flow modelling of this system is challenging and should incorporate the following constraints: (i) upward against-gravity movement of the hydrothermal fluid in an overall high-pressure environment. This high pressure arises due to the presence of huge ocean-water column above it; (ii) hydrothermal fluid character: very high temperature, anoxic, presence of dissolved metal sulphides, multiphase nature (one liquid phase and one gaseous – usually CO₂ phase), temporal variation of fluid chemistry due to its reaction with the surrounding vent rock and deposition of sulphides in its flow path, and its subsurface convection pattern due to the boiling phenomenon; (iii) hydrothermal fluid – vent rock interaction being retarded by cold and relatively oxygenated saline sea water which comes within the vent, guided combinedly by the differen-

tial vent-rock permeability and the MOR topography.

Such a complex flow system is not yet fully understood. For example, none of the existing models take into account the constraint of subsurface boiling of the fluid and its influence on the overall flow pattern. At this juncture, the whole system can be remodelled in the following line: following Fisher and Becker¹, one can conceptualize hydrothermal fluid flow in the oceanic ridge as to be channelized through a small rock volume, i.e. a plane poiseuille flow to start with. As a second step, the concept of non-isothermal fluid flow due to temperature effect of the channel wall can be considered. Successive consideration of other constraints, such as the Hele Shaw convection cell, will bring out geologically more realistic simulations.

Developing a more realistic hydrothermal fluid-flow model within the MOR would be rewarding from both pure and applied geological viewpoints. Such re-

finement in model would be a fundamental contribution in understanding a complex natural flow system as this. Secondly, this exercise, in the long run, is extendable to other studies like mass balance of element flux in sea water, global heat budget and other geologic aspects related to fluid mechanics such as petroleum flow, use of geothermal energy, dispersion of chemicals in groundwater, and possibly feasibility study of radwaste disposal in ocean floor.

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A role model

I share the views on an editor's job and its pros and cons¹. Yes, though the editor acquires knowledge by bits and pieces, the benefit drawn by going through precious jewels of writings is immeasurable. The editorial comments on *The Shaping of Indian Science* are worth pondering.

The reference to B. P. Radhakrishna and his contribution to science is timely. His unmatched ability to comprehend issues of public interest and contemporary research trends made him a role model to many. He has proved what an enlightened octogenarian with a simple Indian way of life can achieve. His resolve and dedication have done marvels to scientific publication, particularly in the field of earth sciences. Some of his remarks on 'Successes and failures of Indian science'², 'Linking of major rivers of India – Bane or boon?'³, 'Tragedy of Kudremukh'⁴, 'Babudom and the future

of India'⁵ and his condolence notes on Nani Palkhiwala and Kalpana Chawla⁶ only indicate his concern for the country and countrymen.

While commenting on state of bureaucracy he writes, '... depend on our ability to reform and transform our Babudom from the present state of colonially inherited consciousness of being masters of the people into true servants of the people and society'. His views are guiding principles to many policy makers and researchers. Since wisdom of the past is as essential, in planning for the future, Radhakrishna's direction to understand geological problems is imperative. The grand old man of Indian earth sciences has been an inspiration to many researchers and students. The Sahni Institute, Lucknow has a fruitful association with Radhakrishna and on the threshold of his 85th birthday, homage to him which is only a paid reminder to us about how

a single man can follow his beliefs and serve the country.

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