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The mantle plumes debate in the classroom

Gillian Foulger
Durham University, Earth Sciences, Durham, United Kingdom (g.r.foulger@durham.ac.uk, +44 191 334 2301)

There is a vigorous ongoing debate about whether or not mantle plumes exist. This debate has highlighted more issues than just technical ones, including how Earth science is currently practised, and how research and scientific uncertainty are dealt with in the classroom. The plume model is an hypothesis, not a proven fact. And yet many researchers, whilst paying lip-service to the uncertainty, present it to students as if it is a proven fact. There is some feeling amongst some teachers that students must be presented with a firm position, and that it is inappropriate or confusing to involve them in on-going debates amongst experts. To some extent this results from teachers themselves being unfamiliar with the alternatives to plumes. Little encouragement is thus given to students to become involved in the debate and to consider the pros and cons for themselves. As a result, an excellent opportunity to allow students to participate in an important ongoing debate in Earth sciences is being missed. Also missed is the opportunity to illustrate to students the correct application of the scientific method. The scientific method involves attempting to disprove hypotheses, not to prove them. Nor are hypotheses proven by citing consistent observations. A priori assumptions should be kept uppermost in mind and reconsidered at all stages. Multiple working hypotheses should be entertained. The predictions of an hypothesis should be tested, and unpredicted observations taken as weakening the original hypothesis. Hypotheses should not be endlessly adapted to fit unexpected observations. The current inadequate approach to teaching the mantle plumes debate highlights a general uncertainty about how to teach issues in Earth science that are not yet firmly resolved. It also represents a missed opportunity to let students experience the sometimes-surprising way in which science evolves. Involving students in the evolution of the subject and the excitement of major developments is surely the best way to attract them to science.