Using environmental tracers and models to examine hydrological change in the Scottish Highlands

3 year **PhD Studentship** in Aberdeen, Scotland

Starting date: negotiable – latest October 2009
Non-taxable scholarship about £12500 per annum

The Northern Rivers Institute, School of Geosciences, University of Aberdeen, Scotland seeks well qualified, motivated applicants for a PhD studentship. Experience in statistical and numerical analyses, GIS and/or environmental tracer applications would be advantageous. Potential students should give an indication of their research interests and will be required to submit a CV with their application. For further information about the research activities (i.e. catchment hydrology, groundwater / surface water interactions; hydroecology) of the Northern Rivers Institute please go to: http://www.abdn.ac.uk/geography/hydrology

Rationale: In few places will the impact of global warming, climate change and consequent research challenges be greater as in transitional climatic zones such as the Scottish Highlands. Here slight temperature differences determine whether precipitation falls as rain or snow, the degree to which snow packs accumulate and subsequently melt. Hydrochemical and isotopic tracers provide useful techniques for analysing flow pathways and residence times of water at catchment scales (ca. 1-200 km^2), thus providing important process understanding in the context of, for example, diffuse pollution management and climate change prediction. Temporal and spatial variability of tracers in precipitation and stream waters can be high due to climatic and landscape variability. Furthermore, inadequate characterisation of model input and validation data leads to uncertainties in current model applications and predictions. Recent studies have demonstrated the particular value of environmental tracers for evaluating future responses of catchments. Climate change is likely to lead to greater extremes in hydrological variability reinforcing the need for characterisation of behaviour during high flow events and base flow periods. Recently, new technologies are available that enable in-situ continuous measurement of a range of determinands, including conductivity, Cl, and oxygen and hydrogen isotopes. This new, state-of-the-art technology – a Near-Infrared Laser Spectrometer – is part of the isotope lab at the Northern Rivers Institute and has the potential to revolutionise field experimentation in catchment hydrology.

This studentship **aims to link environmental tracers with hydrological models to assess hydrological catchment functioning and possible implications of future climate change scenarios** in mesoscale catchments in the Scottish Highlands. The studentship will provide strong interdisciplinary training that will integrate hydrological field monitoring and multi-scale modelling studies within a GIS framework by coupling contemporary process studies with longer-term predictions.

The research programme will involve specific tracer methodologies for field testing and appropriate experiments designed to examine flow pathways and residence times of water mesoscale catchments; undertaking practical field work in test catchments over a minimum of a full hydrological year and synoptic sampling; generation of data appropriate for integration within a modelling framework; data analysis and application of tracer hydrology models. The value of the data will be quantified through examination of model simulation uncertainty. Implications of the results for predicting future catchment responses to climate change, and for definition of catchment response distributions will also be assessed.

If you are interested and for further queries, please contact **Dr. Doerthe Tetzlaff (Northern Rivers Institute, School of Geosciences, University of Aberdeen, Scotland): d.tetzlaff@abdn.ac.uk**