How low can you go? Evaluation of novel ion chromatographic methods for determining trace dissolved ionic species in glacial ice

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2. **Summary:** Accurate determination of trace concentrations of ions, including nutrients such as phosphate, ammonium and carboxylic acid species, is of critical importance for chemical profiling of ice cores, snow and glacial meltwaters. Sample volume is always at a premium and limits of quantification in the nanomolar to micromolar range are required. The gold standard method for this work is bench-top Ion Chromatography (IC), which enables separation and subsequent quantification of ionic species. Very recently, new capillary IC approaches have come on line, boasting advantages such as low sample injection volumes, low reagent consumption rates and faster results with high mass sensitivity. These methods use columns of just 0.4mm in diameter (compared with 2-4mm for analytical systems), sample volumes in the µL range (10 times smaller than that required for standard analytical IC). However, there is very little data on the performance of capillary systems against standard analytical IC systems for the analysis of dilute solutions, such as those found in ice cores and glacial meltwaters. **The goal of this MScR is to conduct a full evaluation of the performance of capillary and analytical IC systems for the analysis of dilute waters (using Dionex ICS5000 capillary and analytical systems).** These data will be the first of their kind and will be of high value both in glaciology and the wider field of water quality analysis.

This project is in collaboration with the leading global developer of IC instrumentation (Thermofisher Scientific), and is well suited to candidates who wish to either pursue a career in the water analysis industry or in academia. The appointed person will spend ~10 months working in the Low Temperature Experimental Facility in Bristol (LOWTEX, [http://www.lowtex.co.uk/](http://www.lowtex.co.uk/)), with visits to the Thermofisher UK HQ. Preference will be for applicants with a background that includes a significant chemistry component (e.g. via a Geosciences/Geography degree or Chemistry degree).

3. **Added value**

- The student will be fully trained in IC (analytical and capillary)
- The project benefits from analytical support from Thermofisher Scientific and the opportunity to participate in fully funded UK IC workshops
- The student will have the opportunity to undertake paid part time employment in the LOWTEX as part of this position.

**Photos:** (from left to right), a Thermofisher-Dionex Ion Chromatograph (ICS5000- analytical system) in LOWTEX, ice cores and glacial meltwaters, which contain low concentrations of ionic species (including nutrients). Being able to analyse these species with high accuracy and using very small sample volumes is critical for constructing records of past climate (for ice cores) and the export of nutrients from ice sheets (for meltwaters).