

JUSTIFICATION OF RESOURCES

Directly incurred

Research staff

We request support for two PDRAs on Grade x Point x (36 months each), one based in Reading, the other one in Nottingham, for the following reasons. Firstly, success of this project strongly depends on the availability of a full-time researcher who will incorporate the latest soil physical theory regarding below-ground water (vapour) and heat transfer into the JULES land surface model, as well as being responsible for verification of the modified model.

Furthermore, driving and verification data, as well as surface boundary conditions need to be collated and combined from existing data sources to allow for model verification, sensitivity analyses and eventually impact studies. In addition, a full time researcher with good knowledge of numerical analyses and GCHPs will be required to develop GCHP code and incorporate this into JULES. This person will also be involved in the modelling studies mentioned above.

Also, we ask for 5.5 months worth of BGS research staff time in relation to the development of the groundwater model and incorporation of this into JULES. To accelerate the process of model improvement and meteorological data handling, and so to ensure the entire project progresses as scheduled, we seek funds for 12 months, 33% time for an NCAS-Climate based PDRA (currently being recruited) to assist and bring up to speed the PDRA responsible for Jules.

Finally, a small amount of funding is required for a field technician to install and maintain micrometeorological sensors at GCHP verification sites. Staff working less than 100% time on the project will record their time on timesheets.

Travel and subsistence

Travel and occasional subsistence is requested to allow six-monthly review meetings (alternating between the partner sites) and additional meetings and exchange visits between the researchers when necessary.

Funds are also requested to allow attendance of the PDRAs, PI and Co-Is at national (e.g. CIBSE meeting; Royal Meteorological Society or JULES meeting) and international conferences (e.g., ASHRAE, USA; EGU, Vienna) to disseminate research findings and to keep up to date with advances in the field.

Funds are also sought for T&S to deliver seminars to the wider community at meetings organised by institutions such as the GSHP Association. Finally, travel funds are required for visits by a field technician to install, maintain and replace sensors and wireless network nodes at the GCHP verification sites.

Equipment:

The simulations with the distributed version of JULES require a large amount of CPU, hence we require a dedicated workstation for this (Sun Fire V40Z, 4xAMD Opteron 856, Sun Microsystems, USA). In relation to this we need suitable repositories for storage of large data sets and output files (24 TB TRANSTEC RAID, Transtec, Germany).

Other costs:

We seek funding for software licences and computing consumables. The Department of Soil Science has a whole suite of micrometeorological sensors (purchased with funds from previous NERC projects) that will be used to monitor the environment at the GSHP verification site.

However, to enable unobtrusive (these are private, not experimental sites) and reliable monitoring of the soil environment in the immediate vicinity of the GSHP, we ask for funding to purchase one set of MicaZ wireless nodes, as well as the associated equipment needed to programme them, house the uplinks, and mobile/GPS modems.

Funds are also requested for NATMAP soil data (NSRI). Support is needed for sensor calibration and maintenance. Sun Fire workstation maintenance costs are also requested. Vehicle hire to transport equipment to the experimental sites is required.

Directly allocated

Investigators:

The PI, UoR, (6 h/week) will oversee the entire project and provide expertise in soil-vegetation-atmosphere exchange (in particular parameterisation of below-ground water vapour fluxes, coupled heat and moisture transfer, the calculation of soil thermal properties).

Co-I A, UoR, (6 h/week) will provide advice on climate data extraction and processing, downscaling to proper spatial and temporal scales, as well as on the baseline JULES climatology, GIS products and education of PDRA_LSM regarding coupling issues and climate issues.

Co-I B, UoN, (4 h/week) will advise and assist the PDRA responsible for the development of the GCHP model and related model simulations. Co-I C, BGS, (4 h/week), will oversee and assist with the groundwater modelling.