

## **Report from the H+ International Evaluation Committee**

The International Evaluation Committee for the H+ network of hydrogeological sites met on 19 September at the University of Rennes. Members of the H+ network presented progress to date, first outlining key aims of the network and key scientific outcomes. Presentations followed, covering specific results from each of the sites along with cross-network activities, training and database developments. The network then offered their vision for the future of the network. The meeting concluded with a verbal report from the International Evaluation Committee. This report summarises the main views and recommendations from the Committee.

The Committee were impressed with the progress of the network. The network has not only made significant scientific advances, much of which has been communicated through a large number of journal papers and conference presentations.

The Committee noted that H+ does not stay within its 'comfort zone' but explores continuously novel scientific questions (for examples links with ecosystems, watersheds, etc.), develops innovative experimental methods and shares its experience and data. It plays a leading role at the national, but also at the European and international scale (for example as being at the core of the ENIGMA ITN project).

The network is producing, on average, 15 publications a year, many of which are in top journals in the field. The Committee saw ample evidence that H+ is working well as a network. 20% of publications are collaborative efforts and it is clear that this rate is destined to grow.

The training elements of H+ are excellent. The network is taking advantage of the range of expertise of senior researchers, infrastructure and equipment in training early career researchers.

The Committee noted that H+ is unique in having a groundwater focus. This is perhaps something that the network could promote even more on an international stage. The Committee recommends that the network makes a concerted effort to promote more H+ internationally. Scientists may consider publishing a consortia paper that highlights some of the network's achievements. This has been done in other network programs and can be effective at encouraging collaboration from outside the network.

H+ has already benefitted from international collaboration and more could be done to advance this. Such collaboration may help the network help, in part, address some of the staff resource challenges. The Committee suggests that H+ considers targeting research collaboration outside the network and perhaps considers using a small level of funding to encourage this, e.g. through early career travel scholarships. Such initiatives have been successful in other consortia.

Intercomparing forward or inverse models using the data from H+ is also an activity that could be fostered. This is feasible with several data sets already acquired on H+ sites. This type of activity has already been done in the past at the French level but could also raise international collaborations around H+. Such dense data sets open also the possibility to investigate the value of information obtained from different types of data.

The Committee were pleased to see that the network allows some academic freedom to explore fundamental scientific questions. However, in some instances it may be effective for the network to communicate specific problems (e.g. trends in declining water quality due to legacy sources or changes in land use) that underpin the scientific questions. Such communication can, at times, be effective in focusing research questions along with demonstrating impact to society. This could also help to reach a new level of synthesis and integration across the different sites and groups in the network and strengthen its role within other overarching networks (OZCAR, eELTR).

As stated earlier, network-type activities are clearly operating. H+ may, however, wish to consider some larger scientific challenges that can draw more on the network capability, demonstrating that H+ as a network is truly much greater than the 'sum of the parts'.

The Committee were impressed with maturity of the H+ database. The network should pursue its efforts to create DOIs for datasets underpinning key papers in order to further advance international utilisation of H+ data, and enhance collaborations. H+ may also wish to think about allowing broader access to the database to support these goals.

In addition, the structure of the database, as well as the code could be shared openly via open source platforms such as github. This will increase the visibility of H+, augment the impact of the work already done to design the infrastructure, and could attract external developers that may participate in the development of the code. Since many other scientific teams in the world are facing similar data storing and managing issues with their own sites, the impact could potentially be very large.

H+ has become part of OZCAR and there is no doubt that this will bring new collaborations and opportunities for more interdisciplinary work. However, the H+ team should ensure that they preserve some of their identity, particularly given its unique groundwater focus. Awareness of their own specific strengths and a clear notion of future goals could allow the H+ network to take a leading role in shaping new initiatives such as OZCAR. At the regional scales, there is also a nice opportunity for H+ to collaborate with the socio-ecological networks also part of eLTER (Zones Ateliers Network) and develop interdisciplinary work with human sciences in general. This is especially true in Brittany where collaboration has already started.

Overall, compared to many other consortia programs, H+ operates on a relatively small budget and so the scientific success of the network is quite remarkable. Several presenters commented on constraints due to staffing budgets. The committee encourages the H+ network to apply for an additional CNAP position. This aspect seems critical to allow the integration of H+ at a larger scale and to link it with novel scientific perspectives. In particular, the engagement with and integration into new monitoring networks and platforms such as OZCAR and eLTER will require steady support by dedicated staff, not only to facilitate this process, but also to ensure the long-term successful operation of H+ within this broader context.

In summary, H+ has excelled in its scientific achievements, through an effective network. It provides an excellent vehicle for training of early career researchers and demonstrates immense value for

money. The Committee have no doubt that H+ will build on its profile and continue to deliver at an international level.

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