Supplementary Material

1 QUESTIONNAIRE QUESTIONS

Table S1. Questions that were sent through email to a stratified random sample of persons that announced vacancies in the About Hydrology mailing list.

Specific model(s) to be used are mentioned

1. What is the status of the project?
   Cancelled / still has to start / ongoing / finished / I'm not involved anymore
2. The vacancy describes that [MODEL] will be employed as model. Why was this model selected for this project?
3. Was this model used in the project?
4. Has there been any discussion about using this model or switching to another model?
5. What was the overall experience with this model in this project? (whether it was the initially intended model or a different model) - e.g., did it perform according to expectations?
6. How was this study funded, e.g., with a grant proposal, internal funds? And in case of a grant proposal, was the model already specified in the proposal?
7. Is there anything else you would like to add?
- Furthermore, could you provide me with the contact details of the person that was hired for this position, or forward this email to that person? I would be interested to get in touch to learn how this person has further developed.

Experience with specific model(s) is mentioned as asset

1. What is the status of the project?
   Cancelled / still has to start / ongoing / finished / I'm not involved anymore
2. The vacancy mentions experience with [MODEL] or [MODEL] as a preferred qualification. Did the hired candidate indeed have experience with this model when hired for this position?
3. Which model was employed in the project, and why was this model selected?
4. Has there been any discussion about using this model or switching to another model?
5. What was the overall experience with the model in this project? (whether it was the initially intended model or a different model) - e.g., did it perform according to expectations?
6. How was this study funded, e.g., with a grant proposal, internal funds? And in case of a grant proposal, was the models already specified in the proposal?
7. Is there anything else you would like to add?
- Furthermore, could you provide me with the contact details of the person that was hired for this position, or forward this email to that person? I would be interested to get in touch to learn how this person has further developed.

Vacancy text does not prescribe or describe model name

1. What is the status of the project?
   Cancelled / still has to start / ongoing / finished / I'm not involved anymore
2. The vacancy does not mention which model should be used for this project. Did you already have a model in mind that could or should be used, before the project started? (if no, please go to question 6)
3. If yes: What were your reasons to prefer this model?
4. If yes: Was this model used in the project?
5. If yes: Has there been any discussion about using this model or switching to another model? (please continue now with question 7)
6. If no: How was the model selected for this project?
7. What was the overall experience with the model in this project? (whether it was the initially intended model or a different model) - e.g. did it perform according to expectations?
8. How was this study funded, e.g. with a grant proposal, internal funds? And in case of a grant proposal, was a model already specified in the proposal?
9. Is there anything else you would like to add?
- Furthermore, could you provide me with the contact details of the person that was hired for this position, or forward this email to that person? I would be interested to get in touch to learn how this person has further developed.

Table S2. Questions that were sent through email to hired candidates of which the contact details were provided by their (former) supervisor.

Hired candidates
1. Did you have experience with modelling when you applied for this position? If yes, how long (rough estimate in years), and with which models?
2. The vacancy mentions experience with [MODEL] as a preferred qualification. Did you have experience with any of these models when hired for this position?
3. From prof [NAME] I understood that the [MODEL] was used during the project. Why was this model selected?
4. How does this model, in your opinion, compare to other [groundwater] models?
5. What was the overall experience with the model in this project? (e.g., how did it perform?)
6. Did your experience with [MODEL] influence for which jobs you applied after?
7. In your current position, are you still working on [groundwater] modelling? If yes, does [MODEL] still play a role in your current position? Or have you switched to another model or other activities?
8. Did your experience with [MODEL] change the way you look at models?
9. Is there anything else you would like to add?

2 METHODS AND RESULTS FOR THE ACADEMICTRANSFER DATABASE

2.1 Vacancies in the AcademicTransfer database

AcademicTransfer (www.academictransfer.com), a platform for careers in science established by a consortium of Dutch Universities, was kindly willing to share their database. The database was an excel file exported from PostgreSQL. The AcademicTransfer database that was employed covered the period June 2017 - June 2021 and contained in total 35,044 vacancies. Of these, 122 (0.3%) were related to hydrology, and 84 (0.2%) were manually analyzed for this study. The screening and analysis consisted of several steps:

1. First, only the hydrologically relevant vacancies were selected by means of a grep (pattern comparison of a string) of the term *hydrolog* anywhere in the vacancy text. This included all vacancies that contained terms such as 'hydrology', 'hydrological', 'geohydrology' etc.

2. Secondly, only the vacancies for PhD, postdoc, lecturer, and assistant / associate / full professor were considered - excluding for instance student assistantships and technical support staff. There was a large overlap in vacancies available for lecturers and professorships, often dependent on which final candidate would be hired. Therefore, a new class named '(Permanent) staff' was defined that included lecturers and assistant / associate / full professors.

3. The third step was to determine if any modelling or simulations were involved in the job. This was done by screening the hydrological vacancies for academic positions on the terms *model* and/or *simul*, again by means of a string pattern comparison. That means that the search would include vacancies that contained words such as 'modeling', 'modelling', 'models', 'simulations', 'simulating' etc. A hit on only one of the two search terms would be sufficient to consider modelling or simulations part of the job. No distinction was made between partly or purely modelling, as was done for the About Hydrology vacancies.

4. Finally, the hydrological jobs for academic positions that involved any modelling or simulations were manually analyzed to determine if a model name was mentioned, either in the project description or as relevant experience.

2.2 Results

From the 35,044 vacancies in the AcademicTransfer database, only 122 contained the pattern *hydrolog* in the vacancy description and/or requirements. Of these 122 vacancies, 84 also included the term *model* and/or *simul*. These terms were used as indication that the position involved the use of models, which would imply that 69% of the hydrology vacancies in the AcademicTransfer database involve modelling or simulations in one or another way (based on this search query, no distinction between partly or purely modelling could be made). This is slightly lower than the 76% that was found for the About Hydrology vacancies.

From the modelling-involved vacancies, 52% were PhD positions, 18% postdoc positions, and 26% staff positions. The staff class combines lecturer and tenure track (assistant / associate / full professor) positions, because there was a large overlap in the vacancies for these categories. All vacancies were situated inside the Netherlands. As such, there might be small overlap with the vacancies in the About Hydrology mailing list of which 2% of the vacancies was based in the Netherlands.

An overview of the results obtained based on the vacancies in the AcademicTransfer database is provided in Fig. S1. The top left panel shows that the terms *model* and/or *simul* were most frequently found in PhD vacancies (83%, compared to 74% in the About Hydrology list), followed by postdoc positions (75% compared to 83% in the About Hydrology list) and the staff positions (49% compared to 62% in the About
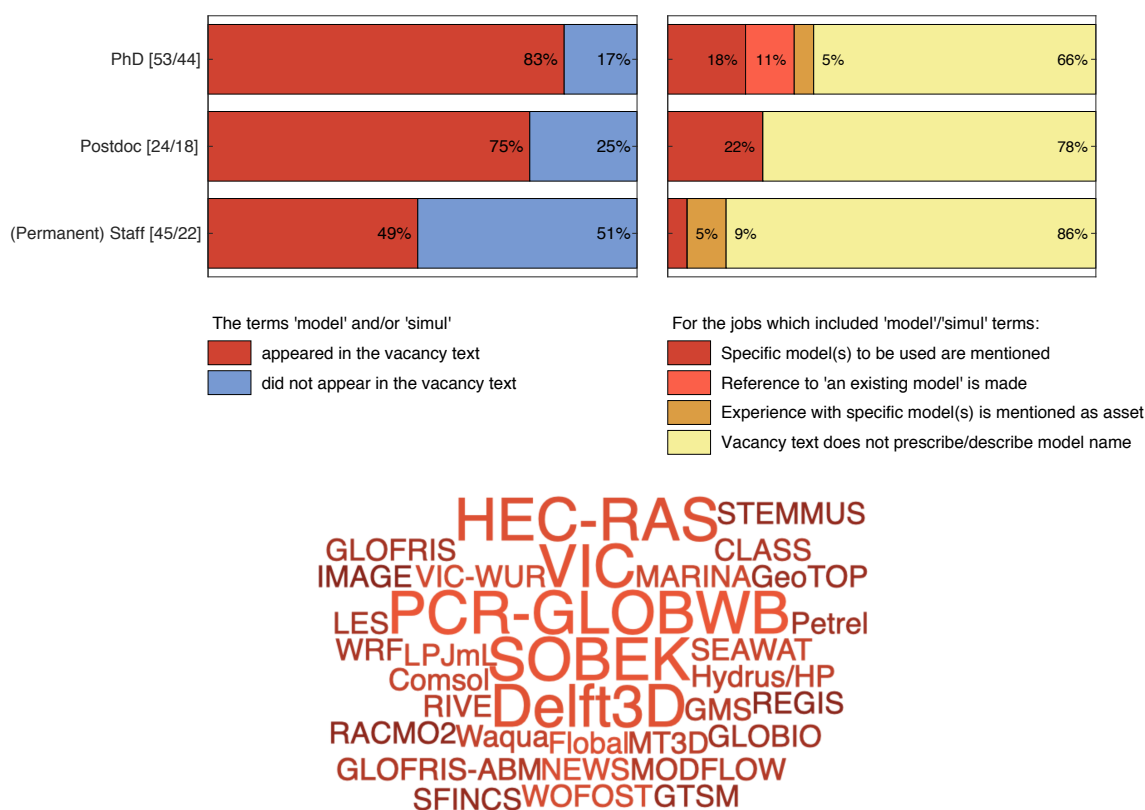
Figure S1. Results based on the vacancies announced at the AcademicTransfer website (positions based in the Netherlands only). Top left: The percentage of vacancies that involved modelling, broken down by position. Top right: The percentage of vacancies in which the model is already mentioned in the vacancy text. The numbers between square brackets behind the positions indicate the total number of considered vacancies, and the number of vacancies that involved modelling, respectively. '(Permanent) Staff' includes lecturer and assistant / associate / full professor positions. Bottom: Word cloud of the model names that were found in the vacancies. The size is proportional to the frequency that the model was encountered.

Hydrology list). Although the numbers slightly differ from what was found in the previous section, they also confirm that a considerable part, the majority even, of hydrology research involves modelling in one or another way.

The top right panel of Fig. S1 gives the percentage of modelling involved vacancies in which a model is prescribed. For PhD positions, 18% of the vacancies explicitly mention a model (resembling the 17% that was found for the About Hydrology list), while 5% of the vacancies only mention a model as relevant experience (resembling the 4% that was found for the About Hydrology list). An example of a prescribed model in a PhD vacancy text is *"You will extend our in-house global hydrology and water resources model PCR-GLOBWB with state-of-the-art crop growth and energy (hydropower, thermo-electric) modules"*. An example of relevant experience in a PhD vacancy text is *"You have experience with hydraulic modelling software (e.g. Delft3D, HEC-RAS, SOBEK)"*. As for the About Hydrology results, also here, models mentioned in the context of experience are generally less strictly prescribed.

While manually analyzing the modelling involved vacancy texts, a third category of model prescription was identified. For the PhD vacancies, 11% did not mention a model name but referred to 'an existing

model'. Examples include: *"Your duties: coupling an existing global hydrological model to a global agricultural production model"*, *"You will translate the data collected into probability density functions and integrate these functions into an existing dune-building model"*, and *"In this PhD research, you will look at the moisture sources of extreme precipitation and floods worldwide (adapting an existing moisture tracking model)"*. Although there is a chance that these sentence refer to any existing model, it seems plausible that a specific model was targeted when referring to 'an existing model'. While this category did not became very apparent in the About Hydrology analysis, it does confirm the hypothesis that models might be less frequently mentioned in PhD vacancies because the applicant will, in general, not be familiar with these model names yet. This would also explain why this category did not appear for postdoc or staff positions. It does also show that the percentage of PhD projects in which the model is already predetermined will be higher than what is found based on whether a model name is mentioned in the vacancy text or not.

For postdoc positions, 4 out of 18 vacancies (22%, compared to 30% based on the About Hydrology list) explicitly mentioned models that could or should be used. There was only one vacancy that referred to relevant experience with a model, but this vacancy also already included a model name in the vacancy description: *"As a Post-Doc you will work on the following research topics: Implement, validate and calibrate large scale hydrological (and crop) models for South America, in particular VIC and LPJmL."*, and further in the text: *"Experience with large scale hydrological (and crop) modelling, experience with VIC and/or LPJmL is an advantage"*.

From the 22 staff positions in hydrology that include modelling or simulations, there was one position (5%) that explicitly prescribed which model should be used. This was a tenure track positions: *"Your focus will be on further developing the global hydrology model VIC-WUR and linking this to other water quality and quantity models used within our group such as WOFOST, Global NEWS and MARINA."*. There were two other positions (9%) which prescribed models in the experience context. Compared to the requested experience for PhD and postdoc positions, the models mentioned in the experience context for staff positions cover a much broader range. For example: *"[...] relevant numerical (e.g. MODFLOW, SEAWAT GMS, MT3D, Hydrus/HP) and GIS-based modelling approaches, [...]"*, includes models with different scales (MODFLOW versus Hydrus) and different goals (groundwater versus variable density flow and solute transport). The prescribed experience therefore provides more freedom to the applicant to go in a certain direction.

The word cloud in Fig. S1 shows which models were mentioned in the vacancies. Most frequently mentioned were HEC-RAS, VIC, PCR-GLOBWB, SOBEK, and Delft3D. It is notable that for the Dutch vacancies in the AcademicTransfer database, there is no clear link to nationally relevant technically demanding models that are maintained by institutes such as was found for WRF-Hydro and the NWM. GeoTOP and REGIS are maintained by national institute TNO, but were not encountered frequently in the analysed vacancy descriptions. Also the suit of models that are included in the Dutch national hydrological modelling framework (Het Nederlands Hydrologisch Instrumentarium, NHI), which are Modflow, MetaSWAP and SOBEK, do not appear very frequently, except for SOBEK.