Elfatih Eltahir: 2017 Hydrologic Science Award

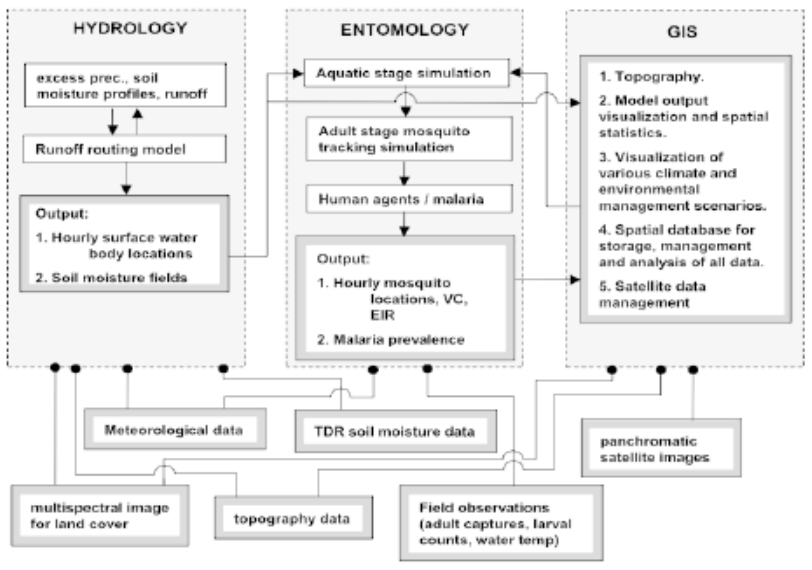
The Hydrologic Sciences Award, known as the Robert E. Horton Award from 1956 to 1998, was established in 1956 and is granted by the Section for outstanding contributions to the Science of Hydrology over a career, with an emphasis on the past five years.

When I was taught my first lecture in Hydrology in the late 1980s, I was introduced to Hydrology as a discipline rooted in two problems: flood forecasting, and design of dams and reservoirs. As a result, I had classes on "Deterministic Hydrology" mainly addressing the first problem, and "Stochastic Hydrology" mainly dealing with the principles relevant to the second problem. In those days, Hydrology had a strong "Engineering" flavor. In the 1990's Pete Eagleson led a broad effort that attempted to redefine Hydrology as a Geophysical Science, just like other Earth, and Atmospheric Sciences. This effort had a significant but limited success in strengthening the "Scientific" foundations of Hydrology. It led to the emergence of "Hydro-climatology", "Eco-hydrology", and "Hydro-epidemiology", with significant impacts on the careers of many hydrologists including myself. However, more than two decades later, Hydrology (the largest section of the American Geophysical Union, a scientific organization) is still studied mostly within Engineering Schools in the US, and many more hydrologists are invited to join National Academy of Engineering, in comparison to the National Academy of Science.

The research in my group at MIT was influenced by the history of our discipline, but we take a step further and embrace the hybrid nature of Hydrology by adopting an approach deeply grounded in science, but motivated to solve a new class of broad and important problems related to climate change. We address two broad questions: How to inform the ongoing societal debate about climate change and its impacts, especially on water resources? and How to Engineer human adaptation to climate change, given that "stationarity" is dead, and some level of adaptation is unavoidable? Given their history and roots in problem-solving approaches, hydrologists are better equipped to address such questions, compared to colleagues with backgrounds in other areas of science.

In my group, we are interested in improving understanding of how global climate change as well as regional land use/land cover change may impact society through changes in the patterns of water availability, extreme weather, and spread of vector-borne diseases. We develop sophisticated numerical models (e.g. MIT Regional Climate Model (MRCM); and the Hydrology, Entomology and Malaria Transmission Simulator (HYDREMATS)) that are used for predicting such impacts at regional scales. We continuously improve on these models, incorporating new knowledge, and testing models' predictions against satellite observations and archived data sets of hydrologic and atmospheric variables, as well as data collected in our own field campaigns. In our research endeavors, we are always curious about how nature works, as reflected in the natural variability of the hydrologic cycle. Often, my students take a multidisciplinary approach dictated by the nature of the problems addressed. Examples for recent research from my group can be accessed at (eltahir.mit.edu/eltahir/highlighted-papers/)

For young hydrologists, at the early stage of their careers, I would invite you to confidently embrace the hybrid nature of our discipline, seek to identify a set of important problems that fascinate you, but always aspire to invent solutions that are grounded in solid scientific understanding of natural phenomena. I believe, this recipe worked for me, and I am confident that it would work for you too.



Schematic Diagram: Hydrology, Entomology, and Malaria Transmission Simulator (HYDREMATS)