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Groundwater availability and sustainability

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Groundwater is the largest available freshwater resource on earth and is critical to humans and the environment. Groundwater is especially important for irrigated agriculture, and thus for global crop production and food security; approximately 40% of today's irrigated agriculture depends on groundwater. In many regions around the world, unsustainable groundwater pumping exceeds recharge from precipitation and rivers. This leads to substantial drops in groundwater levels and losses of groundwater from its storage, especially in intensively irrigated regions, as well as reduction of river flows with possible devastating impacts on freshwater ecosystems.

In my research I simulate groundwater flows and groundwater surface water interactions globally, using a high resolution coupled groundwater and surface water model, and study the impacts of groundwater pumping from the recent past until the far future. In this talk I will present recent findings on current and projected impacts of groundwater pumping on river flows, including an estimate where and when environmentally critical thresholds for groundwater discharge are reached. Second, I will present novel developments and future research steps me and my team will take towards estimating global groundwater availability that can be sustainably exploited and the trade-off between sustainable groundwater use and crop production.