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Bayesian spatiotemporal statistical modelling of water quality within rivers

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Rivers are vital parts of the hydrosphere, providing ecosystem services and water for drinking and agriculture. However, rapid industrialisation and urbanisation globally leads to increasing pollution in many rivers. On their own, many in-river monitoring efforts in lower middle income countries do not yet provide enough information to adequately understand the general state or trends in freshwater ecosystems, presenting difficulties in efforts to mitigate water quality degradation. However, new sources of data such as satellites, drones and sondes provide better spatial and temporal coverage of the river network. This talk presents a statistical downscaling approach for the fusion of data from these different sources into a single product with improved accuracy and coverage compared to that of an individual source, through a Bayesian hierarchical modelling approach. The model development is motivated by the Ramganga river in northern India, a source of irrigation for crops and drinking water that supports millions of people, but suffers from heavy metal and nutrient pollution from population pressures, intensive agriculture and industries along its length, leading to water quality degradation and biodiversity loss. The work takes place as part of the Ramganga Water Data Fusion Project, funded by the UK Global Challenges Research Fund with the aim of informing work such as risk-based modelling and developing future monitoring design to improve mitigation efforts.