

Use of fluorescence in conjunction with radon activity to monitor groundwater-surface water interactions in a system under stress

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A pumping test that was influenced by a natural flood provided a novel opportunity to investigate the response of organic matter fluorescence in a stream to artificially induced and natural hydrological stress. This experiment, conducted at Elfin Crossing in Maules Creek (NSW, Australia), was monitored through the use of multiple tracers collected along a transect of bores.

Throughout the experiment daily samples were collected for radon activity and organic matter analysis via fluorescence measurements, along with field measurements of EC, pH and dissolved oxygen. There were also continuous measurements of temperature and hydraulic head in the various bores, as well as weather conditions. The pump was switched on the second day of the experiment and maintained at a constant rate for 8 days. On the 5th day rainfall started, and increased until the river flooded on the 7th day. Measurements continued until after the pump was turned off.

The fluorescence measurements were performed on a Horriba Aqualog and analysed using a PARAFAC model and well-established components were identified. Overall the fluorescence components displayed a significant response to the movement of the surface water through the subsurface due to the flood, with a smaller response due to the pumping. Whilst the radon measurements predominantly showed a response to the pumping in the deeper bores. This experiment demonstrates the importance of combining multiple tracers to decouple and more fully characterise a system under changing hydrological stress.