The Australian Mathematical Society Medal
2020

Luke Bennetts

Assoc. Prof. Luke Bennetts is an applied mathematician at the University of Adelaide working on challenging mathematical problems applied to geophysical problems, in particular wave–ice interaction and catastrophic ice-shelf disintegration in polar regions. The latter appears to be a key indicator of climate change.

Throughout his career Bennetts has focussed on devising innovative mathematical techniques for problems in hydroelasticity (involving sixth-order boundary conditions), and waves in random and complex scattering media, with applications to ocean wave propagation through the marginal ice zone. He is now established as a research leader in these fields. Bennetts proved a fundamental result on degeneracy of modes supported by hydroelastic systems which has influenced solution methodologies in the field. He also developed fast and accurate spectral methods for complex 3D geometries which are widely adopted by the community. In the field of random scattering media, Bennetts works in the most challenging regime, where wavelengths are comparable to scatterer sizes. He has employed analytical and numerical techniques to identify transitions in global properties of the wave field, empowering new predictions of attenuation rates and directional spreading. He is contributing mathematical advances to catastrophic ice-shelf disintegration at the earth's poles (on which he has a Nature article), ocean wave energy harvesting and acoustic metamaterials. His papers are marked by a striking feature | relentless attention to making sure the mathematical models agree with field observations, measurements, and lab experiments; he is often thoroughly involved in making the measurements or designing the experiments.

The Journal of Fluid Mechanics twice featured Bennetts' research on its front cover, and made one breakthrough article the topic of a 'Focus on Fluids' review, written by an acknowledged expert in the area. His mathematical modelling advances strongly contribute to integration of wave–ice interactions into large-scale coupled numerical models; he has implemented his theoretical developments into an international operational forecasting system and his modelling framework has been adopted by many international research teams. In 2014 he co-initated the Australasian KOZWaves conference series and, since 2016, he has been the Executive Committee Chair. He was awarded the Academy of Science 2016 Christopher Heyde Medal. The methodology that Assoc. Prof. Bennetts creates was inspired by the polar regions, but because they are so important to the world's atmosphere and oceans, it is also immediately applicable to the improvement of and contemporary research in world-scale, coupled, operational climate forecasting. His fusion of analytical mathematics with advanced computational methods empowers real-world, nonlinear, problems to be tackled, solved, and influence the field.