

Photonics

Observing the deep oceans using submarine optical fibre cables

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Abstract: Currently, submarine fibre-optic cables carry more than 98% of the international data traffic, dwarfing the amount carried by satellites. In this talk I will show that these essential infrastructures for communications also show potential for geophysical monitoring in the bottom of the oceans, where the sparsity of geophysical instrumentation is nowadays hampering efforts to quantify extremely important phenomena in our planet and climate change such as e.g. water mixing and stratification. The deployment and maintenance of a larger and denser network of traditional offshore sensors, which would be needed to produce more accurate estimations of climate change models, poses an important economic barrier that has so far proved unsurmountable. I will show that submarine optical fiber cables can be used, with no essential modification, to monitor sea currents across large distances, and also to obtain more accurate observations of water mixing phenomena occurring over tens of kilometers. Among other things, I will show that internal waves, a large-scale phenomenon generated by the interaction of barotropic tides with bathymetric changes in the sea-bottom, can be very accurately observed by deploying chirped-pulse Distributed Acoustic Sensing (DAS) technology over these cables. I will also explain the prospects for using some of these cables for early warning of tsunamis in exposed countries.



Biography: Miguel González-Herráez received the M.Eng. and D.Eng. degrees from the Polytechnic University of Madrid, Madrid, Spain, in 2000 and 2004, respectively. In October 2004, he was appointed Assistant Professor in the Department of Electronics, University of Alcalá, Madrid, Spain, where he was promoted to Associate Professor in June 2006 and later to Full Professor in January 2018. He is the author or coauthor of >150 papers in international refereed journals and >160 conference contributions, and has given >30 invited/plenary talks at prestigious international conferences. His research interests cover the wide field of nonlinear interactions in optical fibers, with particular focus on distributed optical fiber sensing. Prof. González-Herráez has received several important recognitions to his research career, including two European Research Council Grants, the “Miguel Catalan” prize for young scientists given by the Comunidad de Madrid and the “Agustin de Betancourt” prize of the Spanish Royal Academy of Engineering.

Hosted by: Mercedeh Khajavikhan; Michelle Povinelli, Constantine Sideris; Hossein Hashemi; Wade Hsu; Mengjie Yu; Wei Wu; Tony Levi; Alan E. Willner; Andrea Martin Armani