"Environmental Geophysics: providing opportunities for multi-scale, interdisciplinary research from the tropics to the Arctic"

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Near-surface geophysics is the study of the critical zone using geophysical methods, and while most of these methods were originally developed more than a century ago for oil and mineral exploration, they now involve a very wide spectrum of environmental applications, with new approaches constantly emerging. One of the unique capabilities of near-surface geophysical methods is their ability to non-invasively capture the spatial and temporal variability in materials and processes of the subsurface as inferred from changes in a wide variety of physical properties, including dielectric permittivity, electrical resistivity, or acoustic impedance. While resolution and depth of penetration is directly dependent on the particularities of each method, a wide range of scales of measurement are possible given their versatility, particularly in terms of deployment, i.e. from ground-based (sub-meter) to airborne (1000s of meters) scales, even recently allowing remote deployment of near-surface methods in other planets, The current rise in popularity of unmanned aircraft systems (UAS) also presents unique opportunities (when paired with near-surface methods) for bridging the gap between ground-based and aerial scales. In this presentation, the versatility of near-surface geophysical methods is demonstrated through a series of examples and specific applications in a wide variety of latitudes worldwide and under contrasting environmental conditions, and include the exploration of hydrogeological dynamics in wetlands and karst systems, or the characterization of fractured bedrock. The examples presented here also stress the importance of interdisciplinary approaches to properly constrain geophysical results, and the wide applicability range and potential of near-surface geophysical methods to promote national and international collaborative research.

Dr. Xavier Comas is a Professor of Geophysics in the Department of Geosciences at Florida Atlantic University (FAU). He has been conducting research in natural systems around the globe for nearly two decades, from the tropics to the Arctic, including sites in the US (such as Puerto Rico, Florida, Minnesota, Maine or Oregon) as well as abroad (such as in Indonesia, Uganda, Ecuador, Spain, or the UK). His work has focused on better understanding critical zone processes using a variety of hydrogeophysical methods. Research includes carbon cycling in peat soils, formation of sinkholes, or characterization of fractured bedrock. Comas has over 55 peer-reviewed journal articles and book chapters including an edited monograph on carbon cycling and a special issue on natural hazards, and more than 160 abstracts in national and international conferences. Comas is current Past President of the Near-Surface Geophysics Section of the American Geophysical Union (AGU).