Summary of significant research contributions

Dr. Ramesh's diverse research interests focus on understanding the physics of earthquakes, imaging the earth structure and deciphering climate change. Development of cutting-edge techniques based on information theory & inverse modelling approaches are his forte. He demonstrated the unique power of entropy in deciphering the inner workings of the earth-ocean-atmosphere coupled system. Entropy as a novel frontier scientific tool can be realised from the breadth of its application to a wide variety of time-series data. This certainly generated new knowledge in terms of grasping the complex earth-ocean-atmosphere processes which hitherto remained elusive. His latest research provides unprecedented insights into several aspects on the make-up of the earth's interior at a fine-scale. His recent studies on greenhouse gas emissions that trigger the rise in atmospheric temperatures and which alter the basic architecture of climate have received international acclaim.

Most significant among his seminal contributions while exploring frontier areas of research using modern approaches are: (i) Discovery of an anomalous low velocity region underlying the west coast rift system as a possible source region of the Deccan basalts; (ii) Plate motion induced strain has oriented the observed NNE fast seismic anisotropic directions even in a predominantly continental lithosphere like the south Indian shield; (iii) Reconciliation of the observed discrepancy in velocity contrast across the 410-km boundary between seismological and mineral physics data; (iv) Novel use of array seismological techniques to map scattering heterogeneities in the Earth's crust and their geologic correlation; (v) The greater role of mode of formation rather than age in the thickness and composition of the Earth's crust (vi) Recognition of additional stratification in shallow (depth < 300km) mantle in response to plume-mantle interaction; (vii) Innovative use of short-period seismological data to mimic "broadband" features even in complex geodynamic scenarios; (viii) A thick Indian lithosphere and fresh insights into Eastern Ghats evolution based on a relict subducted slab revealed by a modified S receiver function technique; (ix) First application of concept of Cluster Entropy and Information Dimension to Receiver function wave forms for deciphering shallow mantle stratification and discriminate direct converted waves from interfering multiply reflected/scattered waves; (x) Discrimination of genuine mode converted seismological phases from the interfering scattered wave arrivals using information theory based entropy normalized measures of similarity (xi) Direct detection of deep-seated mantle plumes based on seismic response of mantle transition zone thickness to plume buoyancy flux; (xii) Atmospheric Carbon Dioxide as primary driver of climate change during longest interglacial MIS 11 is established using transfer entropy and normalised measures of similarity; (xiii) A rapid cost effective tool for diamond prospecting.