J Geol Geosci 2015, 4:3
http://dx.doi.org/10.4172/2329-6755.S1.003

OMICS International
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International Conference on
Geology

June 22-23, 2015 Florida, USA

Understanding the interaction of multiscale mantle flows at subduction zones through multidisciplinary studies

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The deployment of onshore and offshore geophysical instruments has brought a new level of geophysical observations of the subduction zones, which also provides constraints and motivations for many related studies. Subduction contributes to circulation and the thermal-chemical evolution of the mantle on multiple scales. The sinking lithosphere drives a mode of large-scale plate-driven motion throughout the entire upper mantle at the order of 1000 km. Buoyancy supplied from hydrous input and/or sediments from above the slab have been attributed to smaller scale motion with length scale <5 km. Outstanding questions for the subduction zones include deformation and hydration of incoming oceanic plates prior to and after subduction, segmentation of the subducting slab accretionary wedge, and arc along strike, dehydration of the slab, serpentinization of the mantle wedge, melting processes, volcanism, and seismicity. This session brings together researchers in seismology, geodesy, geodynamics, petrology, and geochemistry to share recent progress in our understanding of the subduction processes.

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Use of remote sensing and GIS for groundwater resources management in Vindhyan Supergroup Compact Rock Terrain, Mirzapur, Uttar Pradesh, India

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A geographical information system (GIS) was used for the integration of the vertical electrical soundings and hydrogeological data acquired using remote sensing to understand the groundwater potential in semiarid region. Detailed remote sensing studies have been carried out in Bakhar watershed area of 560 Km^2 in Mirzapur district, U.P. in the northern part of India. This region exposes Kaimur series of Upper Vindhyan Super group and lithologically consists of Compact Sandstone overlain by Quaternary Sediments. Using Indian Remote Sensing - 1 D satellite LISS - III data, efforts have been made to generate geological, geomorphological and lineament maps. These maps combined with vertical electrical soundings data over 49 locations provide information about the spatial distribution of aquifer up to 70 meters of depth and also give subsurface lithological information. The resistivity soundings data show, resistivity of water bearing zones in the range 30 to 600 ohm. Using GIS tools, weights are given to different thematic maps depending on the influence of ground water recharge and further knowledge based ranks have been assigned to individual classes within a thematic map depending on its significance in storage and transmittance of groundwater. These were then multiplied by the thematic map weights to produce scores. Based on these scores, the watershed was categorized in to different groundwater potential zones. The results indicate that the eastern and northern parts of the study area have very good groundwater potential to meet the demands of water for irrigation and domestic purposes, whereas the southern region has poor groundwater potential zones. Further a management plan has been proposed for water harvesting sites as well as structures such as Check dams, Contour bunding, Recharge pits, Wells and Contour trenching for the sustainable development of groundwater in the region to eliminate water scarcity and its related problems.

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