Anomalous lithospheric and geodynamical evolution of the southern part of Vindhyan basin, central India

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Introduction

Tectonically active sickle shaped Vindhyan basin is considered the largest intra-cratonic Proterozoic sedimentary basin in peninsular India that covers an area of about 200,000 sq.km. It is well known for diamond occurrences. Possibility of hydrocarbon potential has led to a surge in various kinds of geological and geophysical investigations during recent times. An attempt has been made here to synthesize seismic, gravity [1,2] magnetotelluric, geothermal and borehole geological data, which throws a new light into the crustal and upper mantle evolution of this basin.

Significant Results

The southern part of this basin appears to have undergone episodic thermal interactions between crust and hot underlying mantle, which induced magmatism, upwarping and erosion followed by crustal rifting and sedimentation. Seismic data reveals that as much as 10-15 km crustal exhumation may have taken place beneath this region. Almost 5 to 6 km thick Proterozoic sediments have deposited over exhumed high velocity middle crust in the Jabera basin. A high heat flow of almost 80 mW/m^2 has also been estimated for this region, which indicates presence of extremely high Moho temperature and mantle heat flow. Lithosphere has been found to be extremely thin at about 50 Km below Jabera basin. In some geo-tectonic segments, granitic-gneissic upper crust has been totally eroded due to sustained exhumation of deep seated mafic rocks. A 5-10 km thick retrogressed metasomatically altered layer with significantly reduced velocities consequent to interaction with hydrothermal and other mantle fluids, has also been delineated at around mid to lower crustal transition. There is a possibility that this region may have been under the influence of a super mantle plume around 1.1 Ga.

[1] Srivastava et al (2007), *Pure and Applied Geophys* **164**,1-14. [2] Srivastava et al (2009), *J.Geol.Soc.India* **73**,715-723.

Atmospheric Evolution and Chemical Aging of Combustion Organic Particulate Matter

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Organic particulate material has been traditional classified as either primary or secondary with the primary component being treated as nonvolatile and inert. Laboratory and field studies during the last decade, demonstrate that primary combustion aerosol is highly dynamic, consisting of mostly semi-volatile material that moves between the gas and particulate phases in the atmosphere and at the same time is oxidized forming a variety of oxygenated products. This oxidation can lead to both lower volatility material through functionalisation but also to smaller lower volatility molecules through fragmentation. A unifying framework for the description of all organic components based on their volatility distribution and oxygen content (the two-dimensional volatility basis set) can be used for the treatment of a wide range of processes affecting organic aerosol loadings and composition in the atmosphere. This modeling framework is combined with emission characterization studies, laboratory smog chamber studies, and field measurements to simulate the atmospheric evolution of these organic emissions. Applications of this modeling framework to major urban areas (Paris and Mexico City) and continental Europe, where major field campaigns have recently taken place are used to provide insights about our understanding (or lack thereof) of the corresponding physical and chemical processes.

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