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Soumyajit Mukherjee
Editor

Structural Geology and Tectonics Field Guidebook—Volume 1

Editor

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*Dedicated to all fieldwork-based mappers,
geoscientists and surveyors*

Preface

Despite the explosive growth of structural geology and tectonics in the last few decades, structural geological and tectonic fieldwork remain indispensable components of geosciences education in Bachelor's and Master's level worldwide. A (new) field instructor might be in search for (new) terrains close to her institute to explore and demonstrate structures to students. This book fills up that requirement. Through **26 main chapters, 84 authors** and **co-authors** from **13 countries**, the book presents few well-known and several rather unknown transects where exciting structures exist, and field-programs can be established.

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Introduction to *Structural Geology and Tectonics* Field Guidebook

This book consists of 26 main chapters.

Chapter “[Creating Geologic Maps in the Twenty-First Century: A Case Study from Western Ireland](#)”: Swanger and Whitmeyer (2021) discuss the modern techniques of field mapping and the creation of geologic maps using recent software. The authors also elaborate the same using a case study from Western Ireland.

Chapter “[Strain Softening in a Continental Shear Zone: A Field Guide to the Excursion in the Ferriere-Mollières Shear Zone \(Argentera Massif, Western Alps, Italy\)](#)”: Simonetti et al. (2021) field trip in the Western Alps shows evidences of strain softening from ten field stops in the central portion of the Ferriere-Mollières shear zone. The authors further constrain the shearing event between 340 and 320 Ma using in situ U-Th-Pb petrochronology on monazite.

Chapter “[The Geometry and Kinematics of the Southwestern Termination of the Pyrenees: A Field Guide to the Santo Domingo Anticline](#)”: Field trip to the Santo Domingo anticline in the Pyrenees by Pueyo et al. (2021) reveals complex fold kinematics from the fold–thrust belt.

Chapter “[Miocene-Quaternary Strain Partitioning and Relief Segmentation Along the Arcuate Betic Fold-and-Thrust Belt: A Field Trip Along the Western Gibraltar Arc Northern Branch \(Southern Spain\)](#)”: Jiménez-Bonilla et al. (2021) discuss the strain partitioning modes from the hinge to the lateral zones of the Western Gibraltar Arc (southern Spain). Two separate itineraries are presented for the same.

Chapter “[The Southern Iberian Shear Zone \(SW Spain\): Inclined Transpression Related to Variscan Oblique Convergence in a HT/LP Metamorphic Belt](#)”: Díaz-Azpiroz and Fernández (2021) present the ductile mesostructures from the boundary between the Ossa-Morena and South Portuguese Zones of the Iberian Massif (Huelva Province, SW Spain). This boundary developed during the Upper Paleozoic due to the sinistral oblique collision between Avalonia and Armorica.

Chapter “[A Field Guide to the Spectacular Salt Mines of the Transylvanian Basin and Romanian Carpathians](#)”: Tămaş et al. (2021) describe field trips in the Romanian Carpathians and the Transylvanian Basin to study the 3D structural

features of the salt domes and diapirs in the abandoned salt mines. They propose a route with five stops to explain the link between hydrocarbon and salt tectonics.

Chapter “[Spectacular Sandstone Rock Cities in the Czech Republic](#)”: Novakova and Novak (2021) describe sandstone rock cities from the Czech Republic. The Cretaceous sandstones are broken into blocks during the Alpine orogenesis and subsequently eroded to form these spectacular exposures.

Chapter “[Field Guide to RODS in the Pireneus Syntaxis, Central Brazil](#)”: Martins-Ferreira and Rodrigues (2021) present a field guide focussing the linear structural features from the Pireneus Range in Central Brazil. They describe the occurrences as observed at the ten field stations from the Three Peaks area (TrêsPicos) to the Mocó Boulders.

Chapter “[Low Baric Metamorphic Belts in the Northern Tip of the Arabian–Nubian Shield: Selected Examples from the Eastern Desert/Midyan Terranes, Egypt](#)”: Shallaly and Abu Sharib (2021) explore the pelitic metasediments from the LP/HT andalusite-sillimanite-type metamorphic belts of the Arabian–Nubian shield in Egypt. They report multiple phases of deformation in such belts.

Chapter “[Review of the Geometric Model Parameters of the Main Himalayan Thrust](#)”: Ansari (2021) reviews geometric model parameters of the Main Himalayan Thrust along different portions of the Himalaya. He compiles variation in the dip-slip and strike-slip rates of this thrust along the Himalayan belt. This chapter is not a field guide strictly speaking, but keeping this work in mind will be important for the Himalayan field geologists.

Chapter “[Traverses Through the Bagalkot Group from North Karnataka State, India: Deformation in the Mesoproterozoic Supracrustal Kaladgi Basin](#)”: Patil Pillai and Kale (2021) conduct fieldwork along four different traverses within the Balakot Group of the Kaladgi Basin. They report several mesoscale structural features, primary sedimentary structures and bedding plane characters.

Chapter “[Tectonic Framework of Northern Pakistan from Himalaya to Karakoram](#)”: Ali et al. (2021) explore the rocks along the Islamabad–Khunjerab transect of the Pakistan Himalaya. They describe the lithounits encountered over a period of four days that comprise 27 field stops.

Chapter “[Structures of Lesser/Greater Himalaya in and Around an Out-of-Sequence Thrust in the Chaura-Sarahan Area \(Himachal Pradesh, India\)](#)”: Ghosh and Mukherjee (2021) present detail field structural features near an out-of-sequence thrust in the Western Himalaya in India. Such thrusts have been studied so far mainly from geochemical perspectives, and field data were so far missing. This chapter presents a good example of ductile and brittle shear sense indicators, so the reader is referred to few recent publications”: Mukherjee (2011, 2013, 2014a, b, 2015, in press) and Mukherjee et al. (2020).

Chapter “[Structural Geology Along the Nainital-Pangot Road \(Kilbari Section\), Nainital Lesser Himalaya \(Uttarakhand, India\): Focus on Back-Structures](#)”: Puniya and Mukherjee (2021) study the structural geology along the Nainital–Pangot road (Kilbari section) in the Nainital Lesser Himalaya, Uttarakhand, India. The authors report several mesoscale back structures. Such structures have increasingly been

reported from the Himalaya (e.g., Mukherje 2013; 2019; Bose and Mukherjee 2019a, b).

Chapter “[Geology, Structural, Metamorphic and Mineralization Studies Along the Mandi-Kullu-Manali-Rohtang Section of Himachal Pradesh, NW-India](#)”: Singh et al. (2021) present lithounits and structures along the Mandi-Larji-Kullu-Manali-Rohtang La transect in the NW Indian Himalaya.

Chapter “[Tectonics and Channel Morpho-Hydrology—A Quantitative Discussion Based on Secondary Data and Field Investigation](#)”: Biswas et al. (2021) compute 30 geomorphic indices to describe the river channel morphologies and their tectonic controls. They choose three study sites from India: the NE foreland basin of North Bengal, the Singbhum Shear Zone (SSZ) and the Janauri–Chandigarh anticline.

Chapter “[Geological Field Guide: Malvan \(Maharashtra, India\)](#)”: Pundalik et al. (2021) present detail of fieldworks from Malvan (Maharashtra, India) from the lithologic, geomorphic and structural perspectives.

Chapter “[A Field Guide to the Champaner Region, Southern Aravalli Mountain Belt \(SAMB\), Gujarat, Western India](#)”: Joshi and Limaye (2021) discuss the structural features in the Paleoproterozoic basement gneisses to the recent sediments of the Champaner region in Eastern Gujarat (India). They elaborate the lithounits and structures encountered from 15 field stops along four different traverses.

Chapter “[Importance of Fracturing in Uranium Mineralization in Gulcheru Quartzite Host: A Case from Ambakapalle Area, Cuddapah Basin, Andhra Pradesh, India](#)”: Goswami et al. (2021a) map the fault zone in the Ambakapalle area within the Cuddappah Basin. They focus on fractures and their influence on uranium mineralization. The authors also discuss two phases of the alteration of rocks.

Chapter “[Granitic Rocks Underlying Deccan Trap Along the Margin of East Dharwar Craton, Mutnyal \(Maharashtra\)—Bhaisa \(Telangana\), India—General Description and Deformation](#)”: Kaplay et al. (2021) study the structural features from the contact between the Eastern Dharwar craton and the Deccan Volcanic Province. They detail shear tectonics along the contact.

Chapter “[Structural Analyses of the Lunavada–Santrampur Area \(Gujarat, India\) Using Remote Sensing Images](#)”: Chauhan et al. (2021) analyze the folds and lineaments from the Santrampur area (NE Gujarat, India) using remote sensing images. They use Google Earth for identifying various folds geometries, viz. polyclinal folds, second-order folds and superposed folds. This chapter will enable field geologist to get into the detail of the terrain.

Chapter “[Fundamentals of Lithostructural Mapping: Example from the SW Part of the Proterozoic Bhima Basin, Karnataka, India: A Note on Dharwarian Crustal Evolution](#)”: Goswami et al. (2021b) explore the geodynamic evolution of the Eastern Dharwar craton with the help of GPS-aided lithostructural mapping of the SW part of the Proterozoic Bhima Basin.

Chapter “[A 3D Photogrammetric Approach in Mapping Meso-Scale Folds and Shears in Structurally Controlled Syngenetic Mn-Mineralised Zones of Shivrajpur Region, Eastern Gujarat, India](#)”: Joshi (2021) describes an innovative technique of mapping mesoscale structures using 3D photogrammetry. The author maps an

outcrop scale fold from an abandoned mine from the Mn-mineralized zones of the Shivrajpur region (Eastern Gujarat, India).

Chapter “[Vein Geometry Around Bhuj \(Gujarat, India\)](#)”: Omid et al. (2021) present diverse vein geometries from Bhuj area, Kutch Basin, Gujarat, India. Detail field-based and geochemical studies can be taken up in this hitherto unknown area of structures.

Chapter “[Oriented Rock Samples for Detailed Structural Analysis](#)”: Gaidzik and Žaba (2021) discuss how to collect oriented rocks from field for structural geological analyses. This chapter is particularly important to undertake kinematic analyses of shear zone rocks under an optical microscope.

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