Correlation of Stratigraphy Along Strike in the Himalaya

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Incorrect correlation of the stratigraphic units along strike in the Himalaya is currently causing a communication breakdown amongst researchers. For example, researchers who work in Nepal view the Lesser Himalayan sequence as a group of Paleo- and Mesoproterozoic rocks. Above these units and separated by a billion-year unconformity and completing the Lesser Himalayan rock group are the Gondawanan and Foreland Basin sequences. In Northwest India, Lesser Himalayan sequence rocks have terms which refer to their position in relation to the Indian craton – Inner and Outer, and includes Proterozoic rock as well as rock that is as young as Cambrian in age, the Tal Group (Hughes and others, 2005). Rocks unconformably on top of the older Lesser Himalayan sequence and completing the Lesser Himalayan rock group correlate to the Gondawanan and Foreland Basin sequences. This Cambrian-aged Tal Group is referred to as Lesser Himalayan sequence rock but what makes these rocks Lesser Himalayan sequence rock as opposed to Tethyan (or Tibetan) Himalaya rock? Tethyan Himalayan rock deposition also began in early Paleozoic and may extend back into Precambrian time. Some researchers advocate that because of the geographic location of the Cambrian rock toward the Indian craton, they should be called Lesser Himalayan rocks. Some researchers advocate that because of the age of the units, they should be called Tethyan Himalayan rocks. However, are age and/or geographic location the proper way to define a unit? If that is true, than all rocks of a certain age should have the same name which is not sensible if the origins are different. In Nepal, the Lesser Himalayan region is still sometimes referred to as that geographic area between the highlands, Greater Himalaya rock, and the lowlands, Siwalik Group rock. However, Lesser Himalaya should not be referred to as a geographic location, rather, the name should be reserved for the Lesser Himalayan rock group. Age and geographic location are not viable ways to group rocks in the Himalaya; thus, the only plausible correlation that remains is to group rocks that have a similar origin together.

However, this is a difficult idea because researchers can not agree as to the origin of each of these units. In general, across the Himalayan arc, Lesser Himalayan rocks are referred to as those units which are derived from the Indian craton. Thus, the isotopic signatures and detrital zircons should look similar to those of the Indian craton. This is true until one examines the Cambrian "Lesser Himalayan" rocks. These signatures have characteristics which span across the Lesser, Greater, and Tethyan Himalayan rocks (e.g. Richards and others, 2005). This occurs in India, as previously stated, and also in Bhutan. The Baxa Formation has a stratigraphic position that suggests it is part of the Lesser Himalayan sequence but certain samples yield detrital zircons which suggests more similarity to Tethyan Himalayan rocks and ages that are Cambrian-Ordovician in age. Should these units still be referred to as Lesser Himalayan? Or should there be a different name for these units?

In addition, lower Tethyan Himalayan rocks that are Cambrian-Ordovician in age such as the Haimantas Group in Northwest India and Chekha Formation in Bhutan are the same age as the "Lesser Himalaya" units mentioned above, and occupy the geographic region in which rocks are usually referred to as Lesser Himalayan, south of the Greater Himalayan rocks. Are these units more similar than different? Is it possible that the Haimantas Group and Chekha Formation are the units more proximal to the erosion of Greater Himalayan rocks and that the Tal Group and Baxa Formation may be more proximal to the Indian craton? Because of their position as rocks which are eroded from and overlap both older Lesser and Greater Himalayan rocks, both groups of rocks are cover sequences shed into an intervening basin between older Lesser Himalayan rocks and the outer (with respect to India) Greater Himalayan rocks. Thus, these units would contain overlapping ages and isotopic signatures that make them neither "Lesser Himalaya" nor "Tethyan Himalaya". Perhaps a new stratigraphic architecture should be developed or at least a nomenclature that does not cause confusion.

Greater (or Higher) Himalayan rocks are not without difficulty and nomenclature confusion. A subdivision was developed in central Nepal for defining the units formally as Formations I, II, and III and informally as units I, II, and III. However, the system breaks down when attempting to span across the entire arc. In Bhutan, this system is not appropriate. Rocks are not only high-medium grade but include schist and quartzite with primary bedding and do not include a simple tripartite system. In far-western Nepal, unit 2, which is primarily composed of calcsilicate, is not present (Robinson and others, 2006). In northwest India, I have observed that the tripartite system is also not appropriate. In central Nepal, rock that is related to Greater Himalayan rocks in the crystalline klippe do not adhere to this system. Clearly, more work needs to be done understanding how Greater Himalayan rocks, which span an age from ~900 to 480 Ma, are related to the other systems. Because Greater Himalayan rocks can have an age range that overlaps the ages of both Tethyan and Lesser Himalayan rock, more work needs to be done in order to understand the original nature of the contacts between these units.

References

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