

**PROTEROZOIC BASINS OF INDIA- CUDDAPAH BASIN**

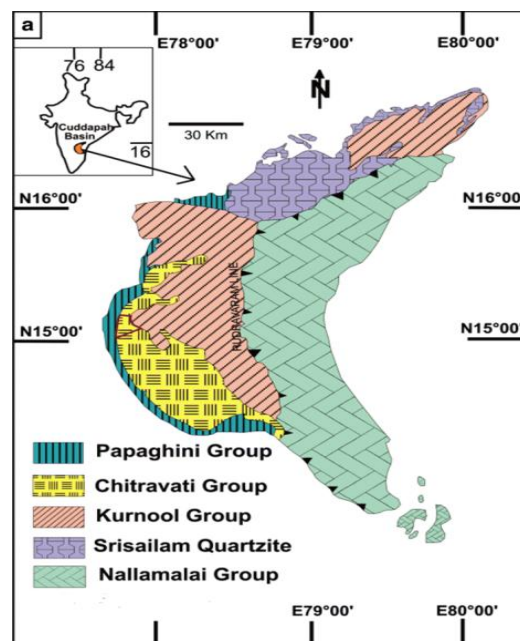
The Cuddapah Basin is a crescent shaped, N-S trending Proterozoic basin in east-central part of the Dharwar craton. The basin spreads over parts of Krishna, Guntur, Nalgonda, Mahaboobnagar, Kurnool, Prakasam, Anantapur, Cuddapah, Nellore and Chittoor within the state of Andhra Pradesh.

The crescent shaped basin is easterly concave covering an area of approximately 44 500 km<sup>2</sup>. The eastern margin of the basin is demarcated by a thrust fault while all other boundaries are part of the 'Eparchaean Unconformity'. The western half of the basin is undeformed and consists of 4 sub-basins: the Papaghni, Kurnool, Srisailam and Palnad (Figure-1). The Cuddapah Basin is surrounded by granitic gneisses, dykes and sills, which terminate at the basin boundary and appear to predate deposition within the basin. The youngest igneous activity in the basin is the kimberlite and lamproite field located near the basin centre.

**Lithology**

Lithologically the Cuddapah basin as a whole is comprised mainly of arenaceous and argillaceous sequences with patches of carbonaceous sediments. It consists mainly of orthoquartzite - carbonate suite, basic to acidic volcanic and sills in the lower part, and siliceous shales with quartzites in the upper part. The characteristic feature of the Cuddapah Supergroup is that each member of the Formation starts with quartzite and ends with dolomite or shale/phyllite except in the middle chitravati group where in this group ends with quartzite with intercalations of shale.

The rocks are unfossiliferous except for the stromatolites described by Vaidyanadhan (1961) along with carbonaceous microfossils like Tawuia, Chuaria, trace fossils and calcareous algae.



**Figure1-** Simplified geological map of the Cuddapah basin (modified after Mitra, R. et al., 2020), with inset showing the location of Cuddapah basin in India.

## Stratigraphy

W. King (1872) divided the rocks of the basin into the Cuddapah (originally, Kadapah) and the Kurnool (Karnul) Formations, the term System now being used for each by most workers. The Cuddapah formation is the older unit and is present throughout the basin. The Kurnool Group was deposited unconformably over the Cuddapah rocks and is concentrated in the western portion of the basin. He noted an unconformity between the Kurnool rocks and the underlying Cuddapah rocks. The Kurnool rocks are confined to two areas, the western part of the basin and an area in the northeast known as Palnad.

Nagaraja Rao and Ramalingaswamy (1976) proposed their classifications in which the Cuddapah rocks are divided into Cuddapah Super-group and Kurnool Group. They introduced the term 'Chitravati Group' into the classification in place of Cheyair Group and it consists of three units Pulivendla Quartzite, Tadpatri Formation and Gandikota Quartzite. Kistna Group of King's classification is removed and Sreesailam Quartzite as a single unit is included in the Nallamalai Group. Kurnool Group is divided into six formations. Late Narayanaswami (1966,1976) has presented tectonic frame work of the basin and has proposed a revised five-fold classification (Table-1).

The Papaghni Series named after the Papaghni river, is exposed along the western boundary of the basin. The Group consists of two formations- the siliciclastic-dominant Gulcheru Quartzite; and the mixed siliciclastic-carbonate-bearing Vempalle Formation. The older Gulcheru quartzite rests over the precambrian peninsular gneiss. The Vempalle Formation overlying Gulcheru quartzite contains predominantly of stromatolitic dolomite and dolomitic shale, with subordinate sandstone (Nagaraja Rao et al., 1987).

Chitravati (Cheyair) Series -is exposed adjacent to the Papaghni Series and also near the central part of the basin. Nagri/Pulivendla quartzite is the oldest and first litho-unit of the Chitravati Series which overlies the Vempalle Formation of the Papaghni Series with a disconformity between the two marked by the presence of conglomerate. Conformably overlying Pulivendla quartzite is the Pullampet/Tadapatri Formation which mainly consists of shales, shale with stromatolite bearing dolomite, shale with tuff, shale with quartzite intercalations. The shales of this formation are splintery in nature. There are reports on some of the sedimentary structures like ripple marks, flame structure, groove and striation casts. The Tadapatri shale grade into Gandikota quartzite, the contact is gradational and conformable one. Gandikota quartzite is the uppermost and youngest litho-unit of the Chitravati Group. Gandikota quartzite conformably overlies the Tadapatri Formation and underlies the Bairenkonda quartzite with an unconformity.

Nallamalai Series is exposed along the Nallamalai hills in the eastern part of the basin and consists of the lower sandstone-dominated Bairenkonda Quartzite and the upper Cumbum Formation, consisting mainly of shales with sandstone and dolomite intercalations. The Bairenkonda quartzite is hard and compact, grey to purple in colour with fine - medium grained texture. It exhibits ripple marks and planar cross bedding. The thickness of the quartzite is 300 mtrs.

Kistna Series of rocks are exposed along the eastern edge of the basin and along the Krishna river in the northern part. This group comprises of Irlakonda quartzite, Kolamnala shale and Srisailam quartzite.

Kurnool Series of rocks consists of about 500m thick succession of alternating quartzite, shale and limestone lying unconformably over the Cuddapahs and are exposed in the western half and the north-eastern tip of the Cuddapah crescent.

The Kurnool Series is subdivided into five constituent formation rank units- the Banganapalli Conglomerate, Auk (Owk) Shale, Paniam Quartzite, Koilkuntla Limestone and the Nandyal shale. The Kurnool sub-basin witnessed strandline, near shore to shallow marine conditions.

<b>C U D D A P A H  S Y S T E M</b>	SERIES	STAGE
	Kurnool Series	Nandyal shale Koilkuntla Limestone Paniam Quartzite Auk Shale Narji Limestone Banganapalle Quartzite
	<i>Unconformity</i>	
	Kistna Series	Srisailam quartzite Kolamnala shale Irlakonda quartzite
	<i>Unconformity</i>	
	Nallamalai Series	Cumbum Formation Bairenkonda Quartzite
	<i>Unconformity</i>	
	Cheyair Series	Gandikota quartzite Pullampet shales (Tadpatri) Nagri/ Pulivendala quartzite
	<i>Unconformity</i>	
	Papaghni Series	Vempalle limestone and shale Gulcheru quartzite
<i>Unconformity</i>		
Archean schist and gneisses.		

**Table 1-** Stratigraphic succession of Cuddapah System.