

Basin Evolution of the Colorado Headwaters Basin (North Park-Middle Park) between 70 and 55 Ma.

Marieke Dechesne



NASA image showing the position of the Colorado Headwaters Basin (white arrow), compared to its neighboring Laramide basins: the Denver – Cheyenne Basin across the Front Range to the east, and the South Park Basin directly south.

The Colorado Headwaters Basin (CHB), underlying North Park and Middle Park in north-central Colorado, is a folded remnant of a Laramide depositional basin that subsided between two basement uplifts. The stratigraphic record of this basin in comparison to the nearby strata of the Denver and Cheyenne Basins gives insights into the Laramide evolution of the Front Range. This study is part of the USGS North Park-Medicine Bow Mountains Project and is based on outcrop information, subsurface geophysical well logs, palynology, paleobotany and radiometric dating.

Correlations in the sandy part of the Cretaceous Pierre Shale are used to determine the depth of erosion prior to initial basin formation and before rapid sediment accumulation started at about 60 Ma. These correlations reveal subtle folding, tilting and extensive erosion prior to deposition of the Paleocene-Eocene Coalmont and Middle Park Formations. In general, 3000-4000 feet of Pierre Shale and latest Cretaceous sediment were eroded over most of the CHB between about 68 and 60 Ma, prior to the onset of Coalmont deposition. Several thousand additional feet of Pierre Shale and older strata were also eroded near internal basement faults and the basin margins.

Fossil leaf margin analysis shows that at 58 Ma this area was elevated significantly higher than the nearby Denver Basin. Within the CHB synorogenic strata angular unconformities are present, and combined with the other observations, indicate multiple phases of deformation and fault activity before, during and after deposition of the Coalmont and Middle Park Formations. The sedimentary record suggests that in parts of the basin, the current basin margins do not coincide with the Laramide basin geometry during deposition.

Bio

Marieke Dechesne is currently working as a contractor for the North Park – Medicine Bow Mountains Project at the USGS. Her task is to manage the subsurface dataset and integrate it with field observations, and any other data collected by the rest of the team. She has recently worked with the Denver Museum of Nature & Science and the Colorado Geological Survey on the Denver and Cheyenne Basins. This collaboration has led to the publication of several maps and cross-sections on the Denver Basin (which are for sale via the CGS). She has done fieldwork in Europe, Costa Rica, Bolivia, Tanzania, West-Texas, Utah, the Denver Basin and recently, North Park-Middle Park. She has worked for several years as a researcher at Colorado School of Mines and has taught classes in GIS for geologists both at CU and CSM. Her geology degree is from the University of Utrecht in the Netherlands.

Back to the [RMS-SEPM Luncheon Page](#)

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