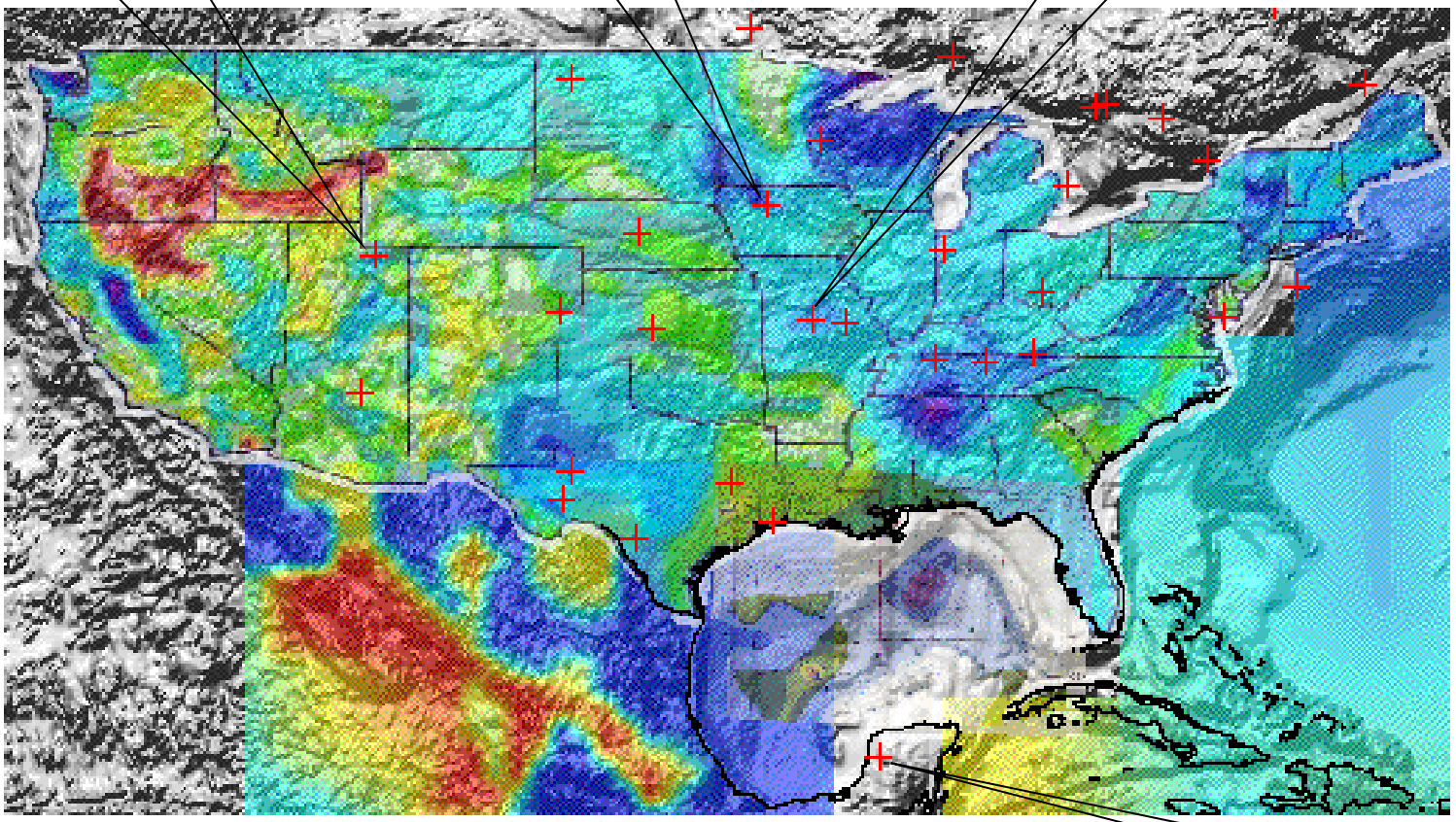
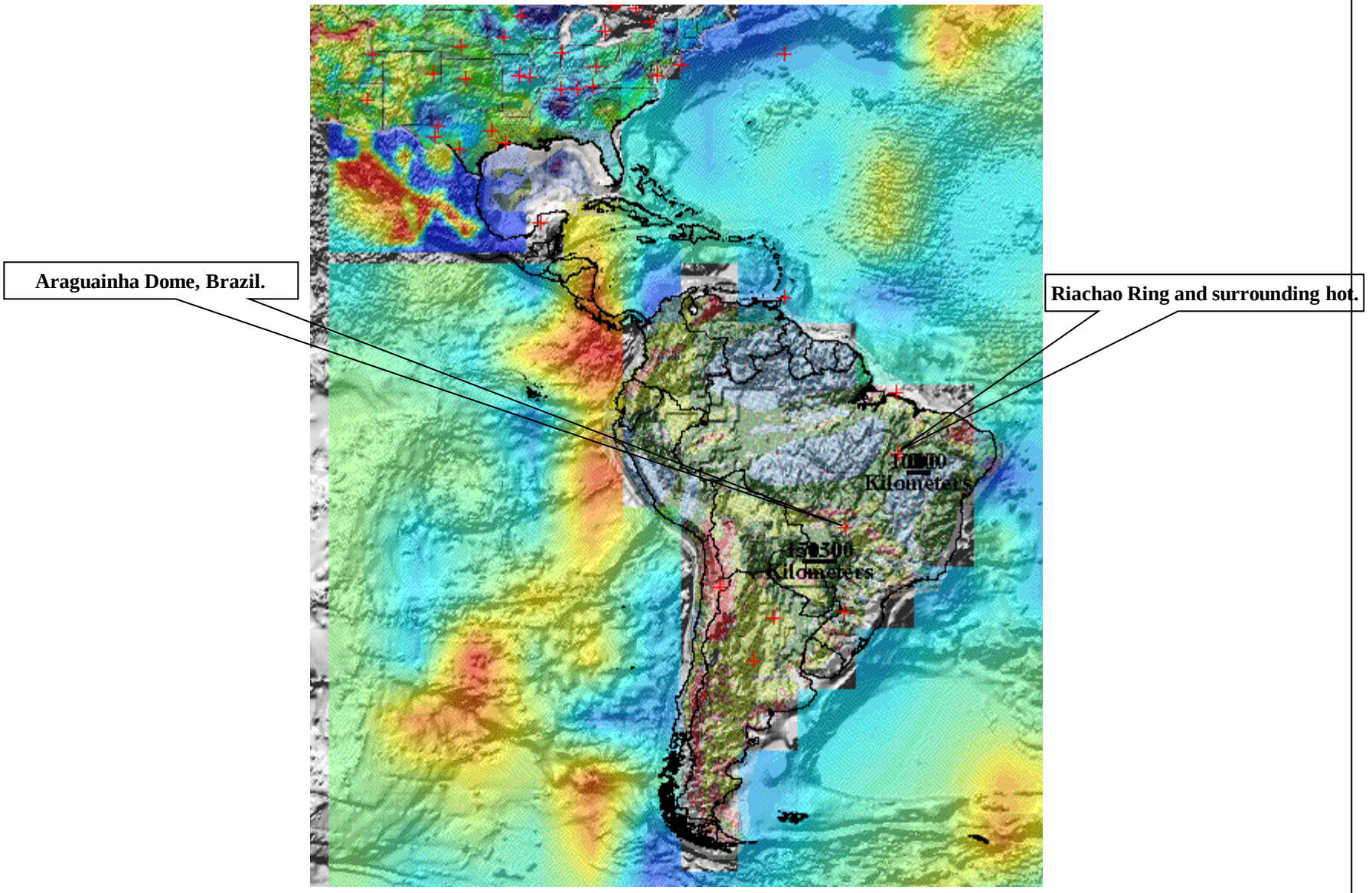
Thermal Effects of Meteorite Impact Structures over Geologic Time

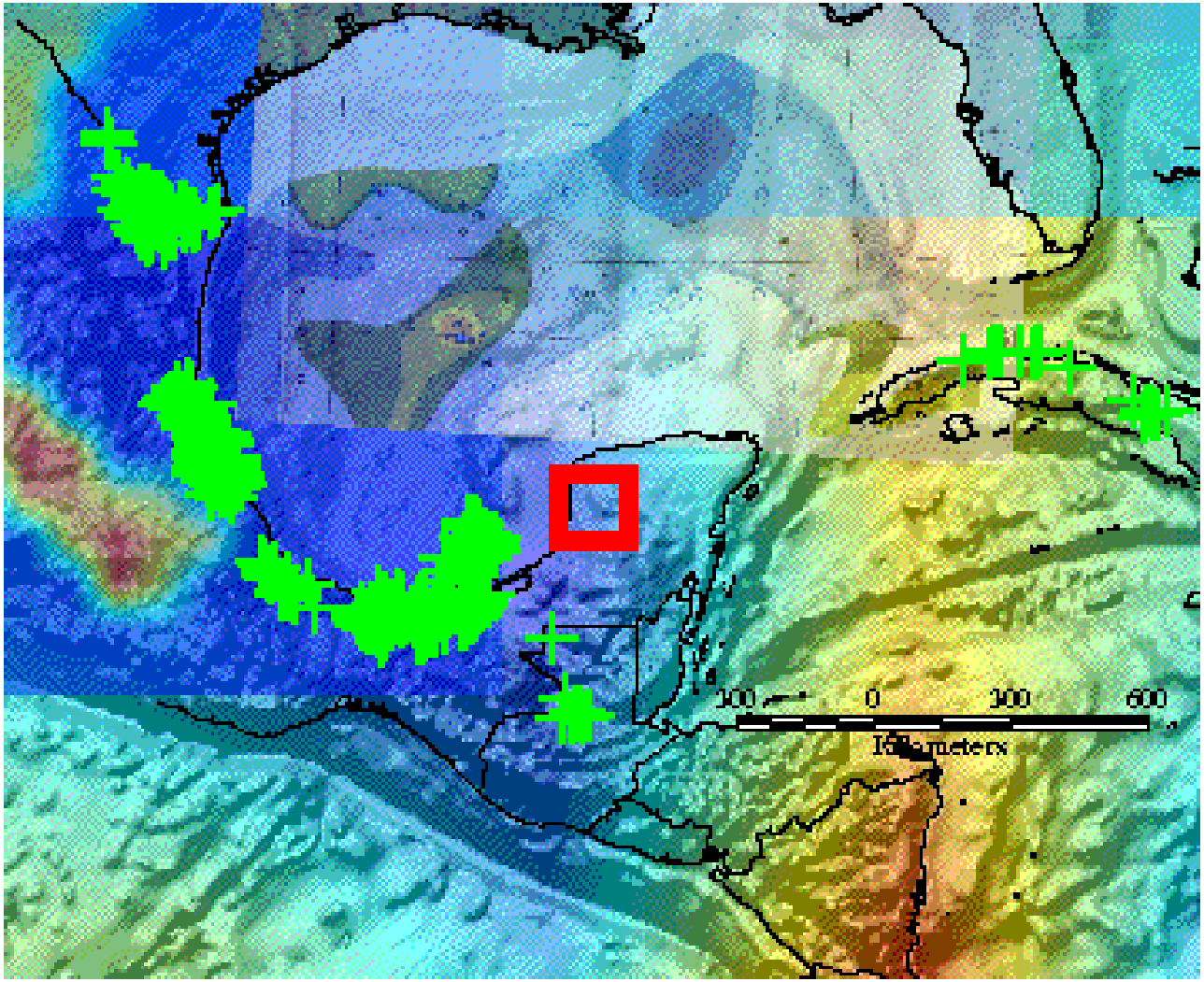
D. B. Buthman and M. M. Butler, 1999



Mean thermal gradient, United States, obtained by heat flow divided by conductivity (source: www.smu.edu/geothermal/heatflow/heatflow.htm, 1999). Red crosses are selected impact craters.

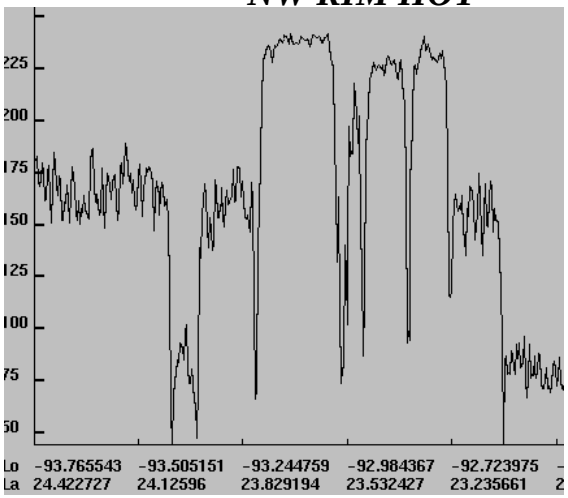


Index Map. Geothermal gradients, selected impact craters, on shaded relief bathymetry / topography.

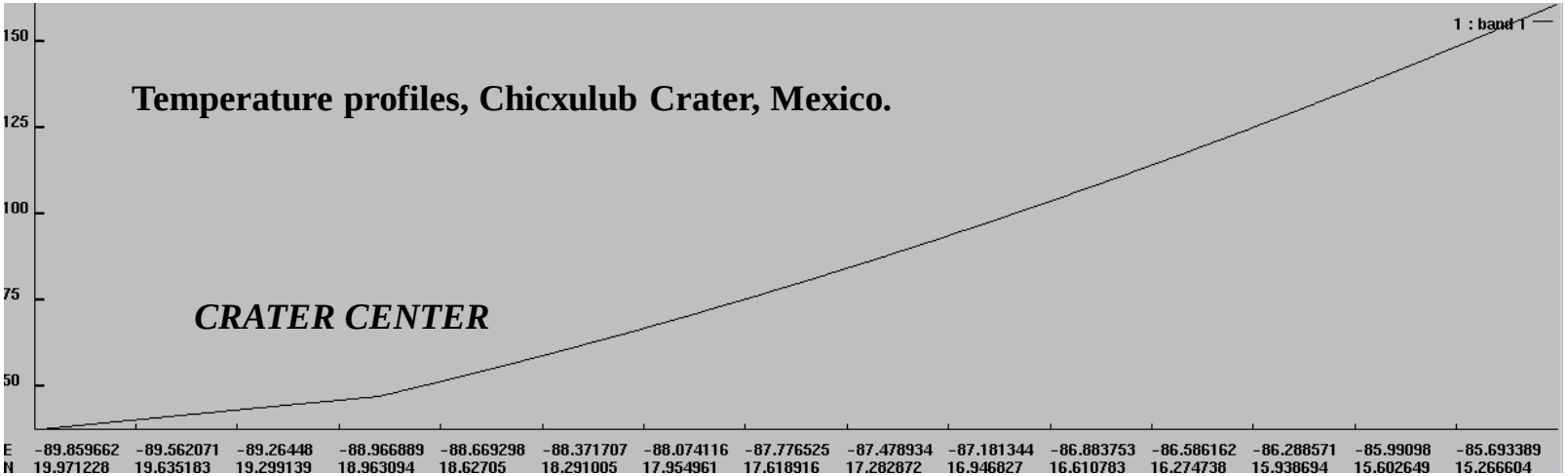


Gridded and imported heat flow maps (color) on shaded relief bathymetry / topography, with oil and gas fields in Mexico (green crosses) and Chicxulub Impact Crater (red box). Data from DNAG and NGDC.

NW RIM HOT

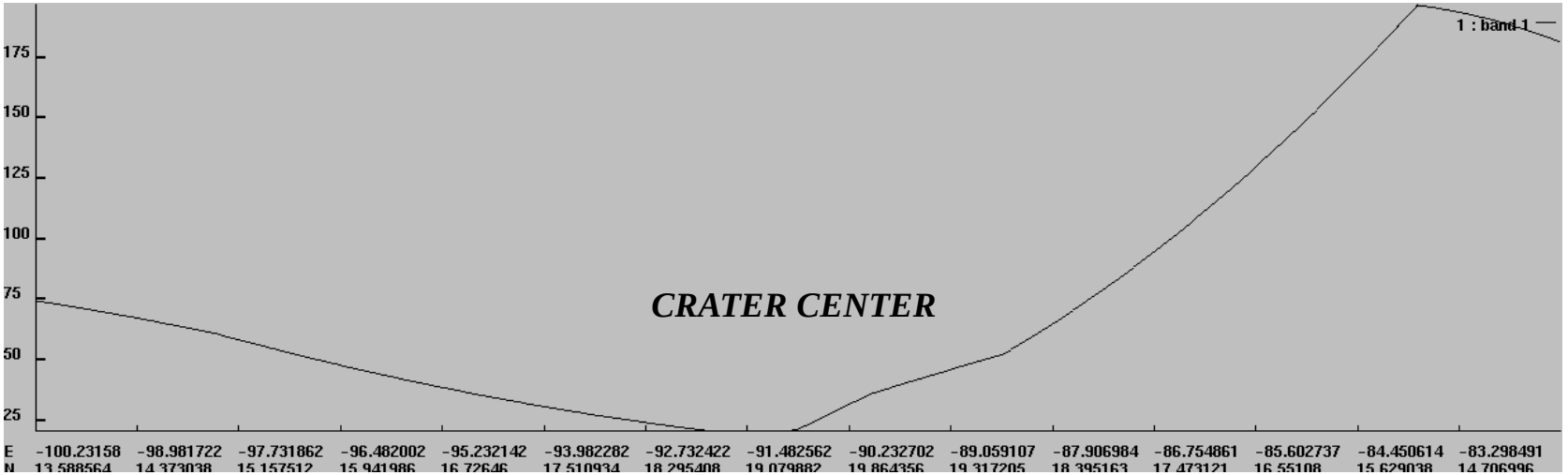


SE RIM HOT

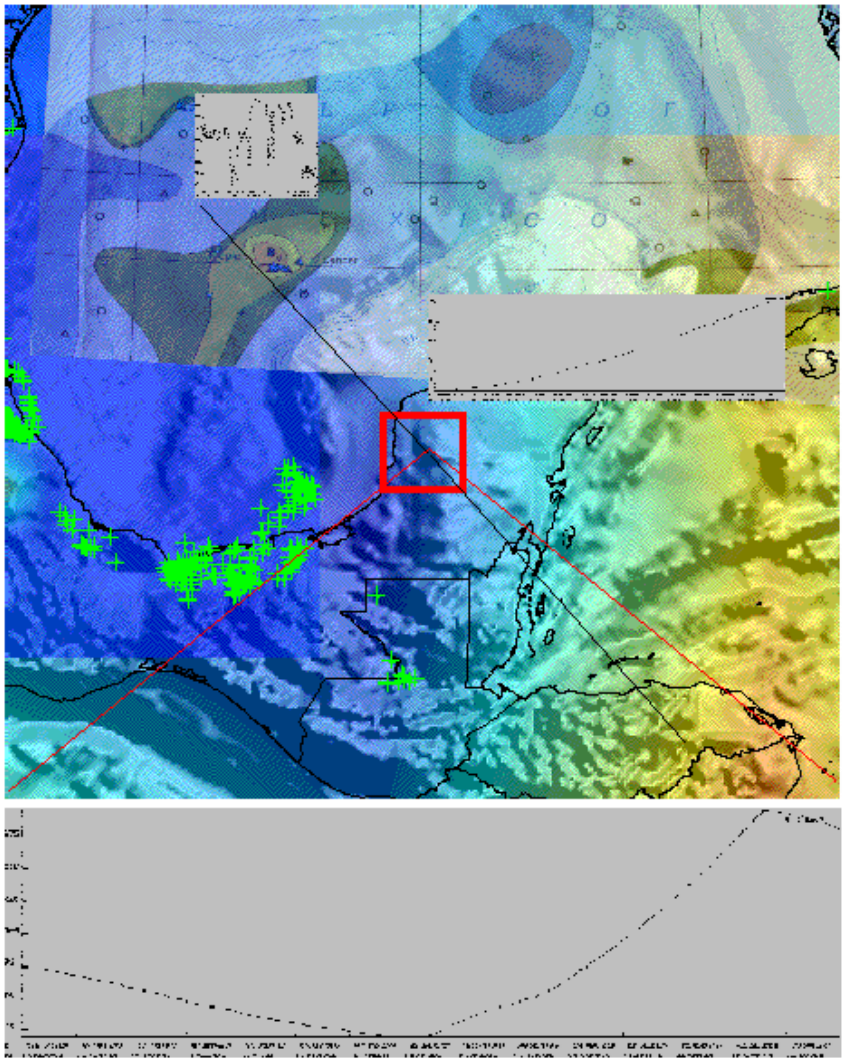


Temperature profiles, Chicxulub Crater, Mexico. Data sources: DNAG (top), NGDC (bottom).

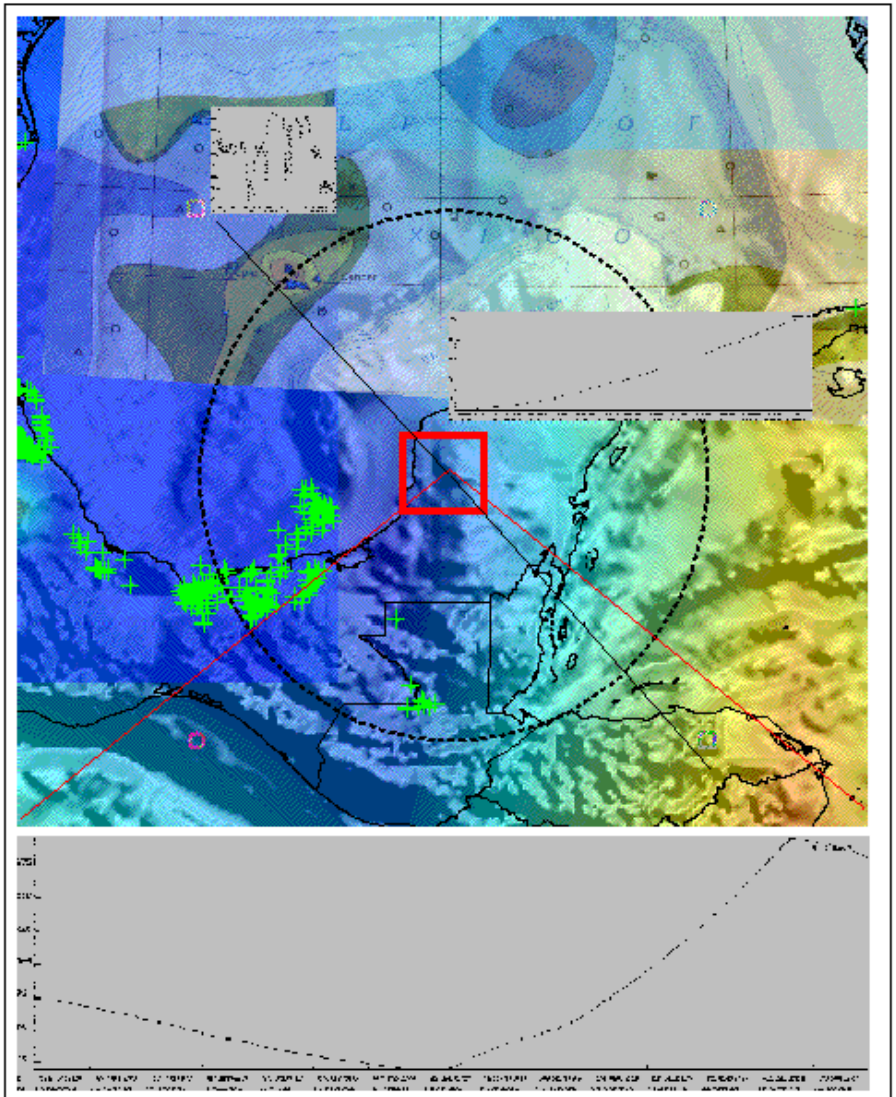
NW **SE**



Geothermal gradient profile, Chicxulub Crater, Mexico. Data source: NGDC (bottom).



HEAT FLOW / GEOTHERMAL GRADIENT DATA INTEGRATIONS ON SHADED RELIEF BATHYMETRY / TOPOGRAPHY, GULF OF MEXICO.



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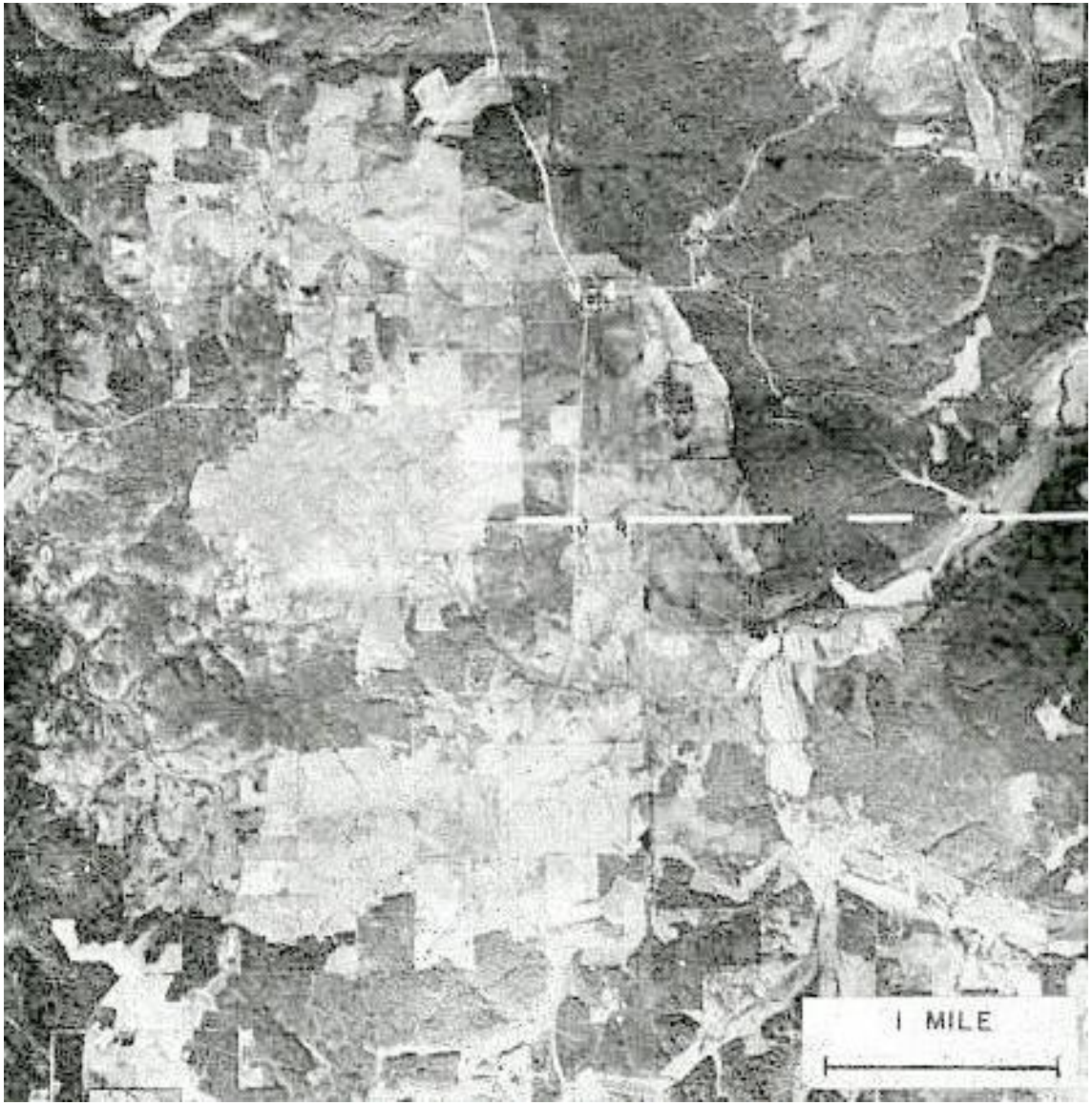
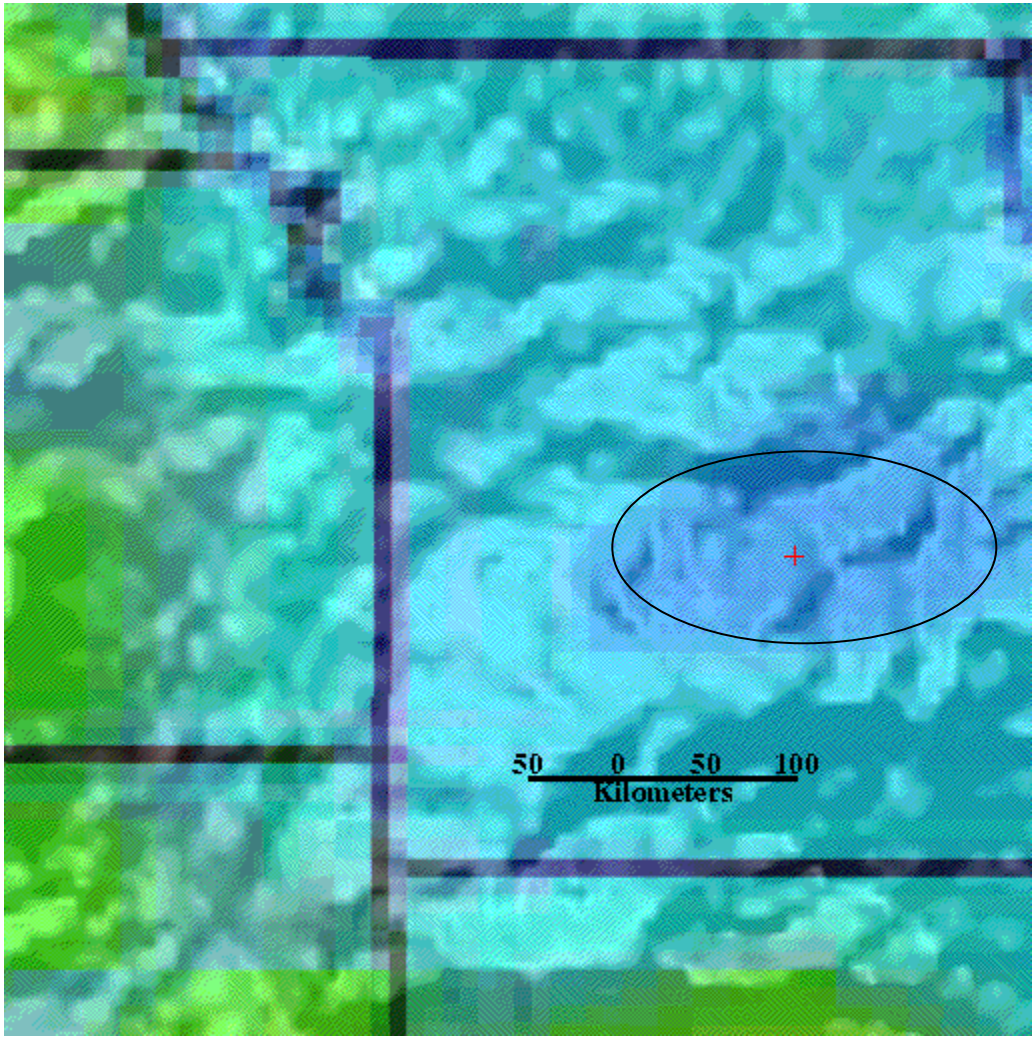
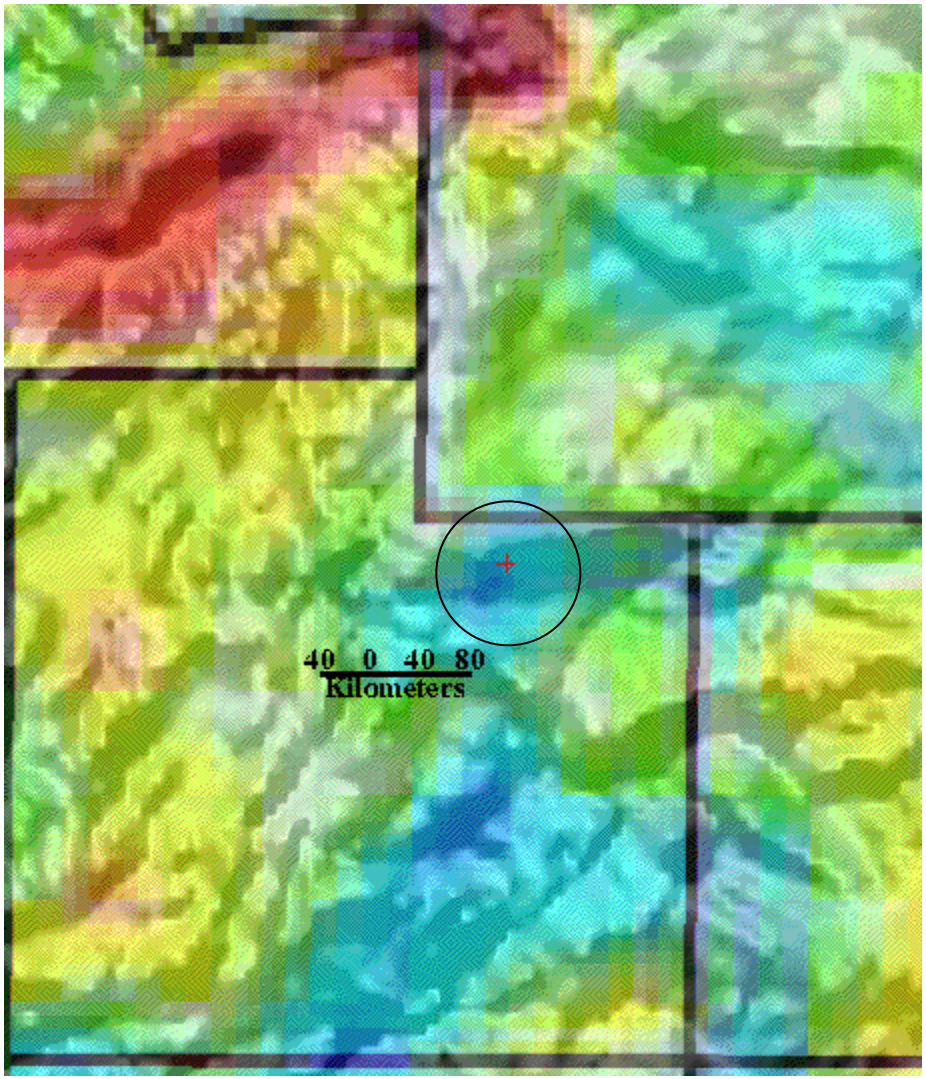


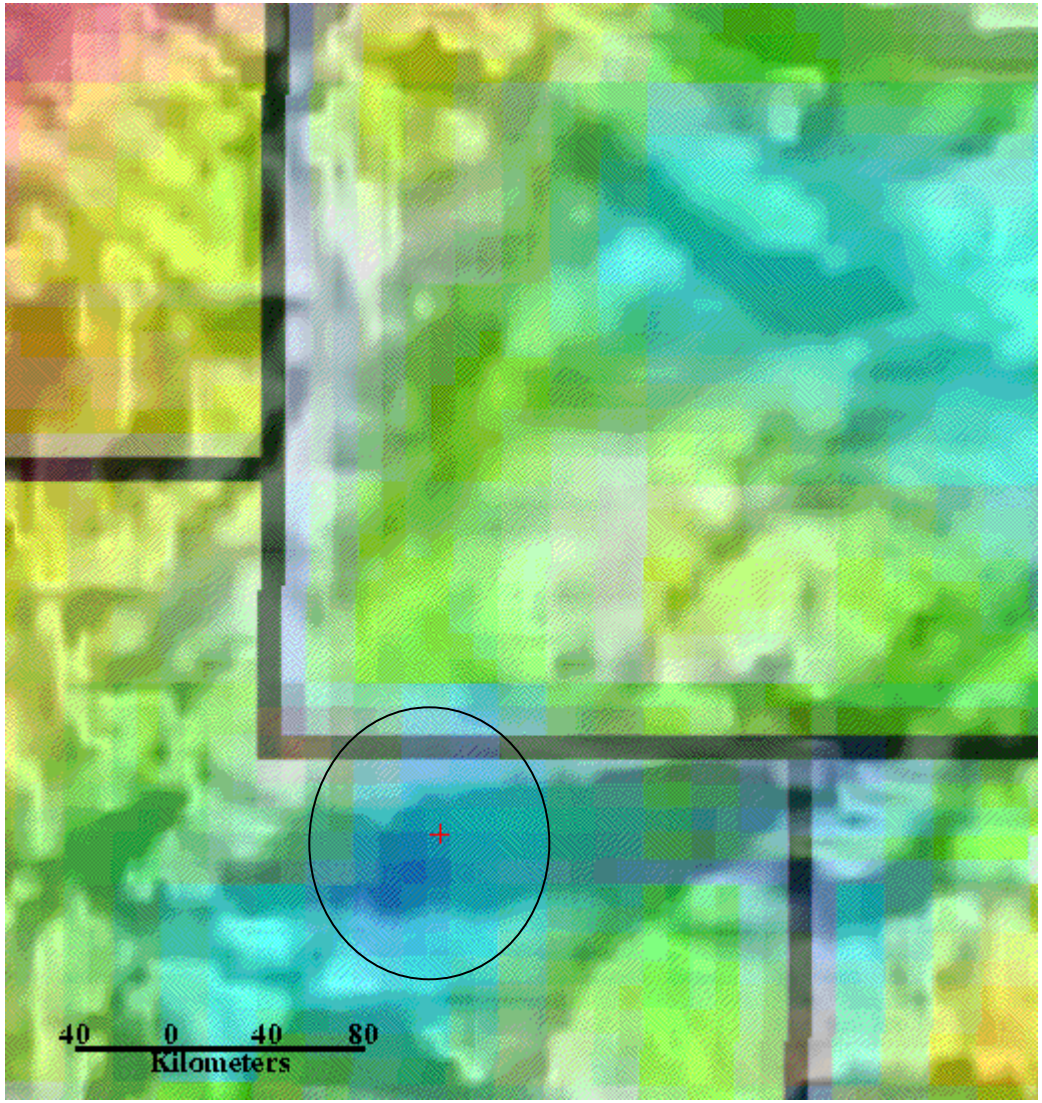
Decaturville Crater, Missouri, aerial photograph.



Decaturville Crater, Missouri, 6 mile diameter complex crater approximately 300 Ma old. Note coincidence of low geothermal gradient and impact crater, suggesting the temperatures have long dissipated.



Northeast Utah, USA. Mean thermal gradient on shaded relief topography. Red cross is Red Creek Impact Structure, 25 km diameter, 1550 Ma years old. Note the coincidence of the cooler blues and the point of impact.



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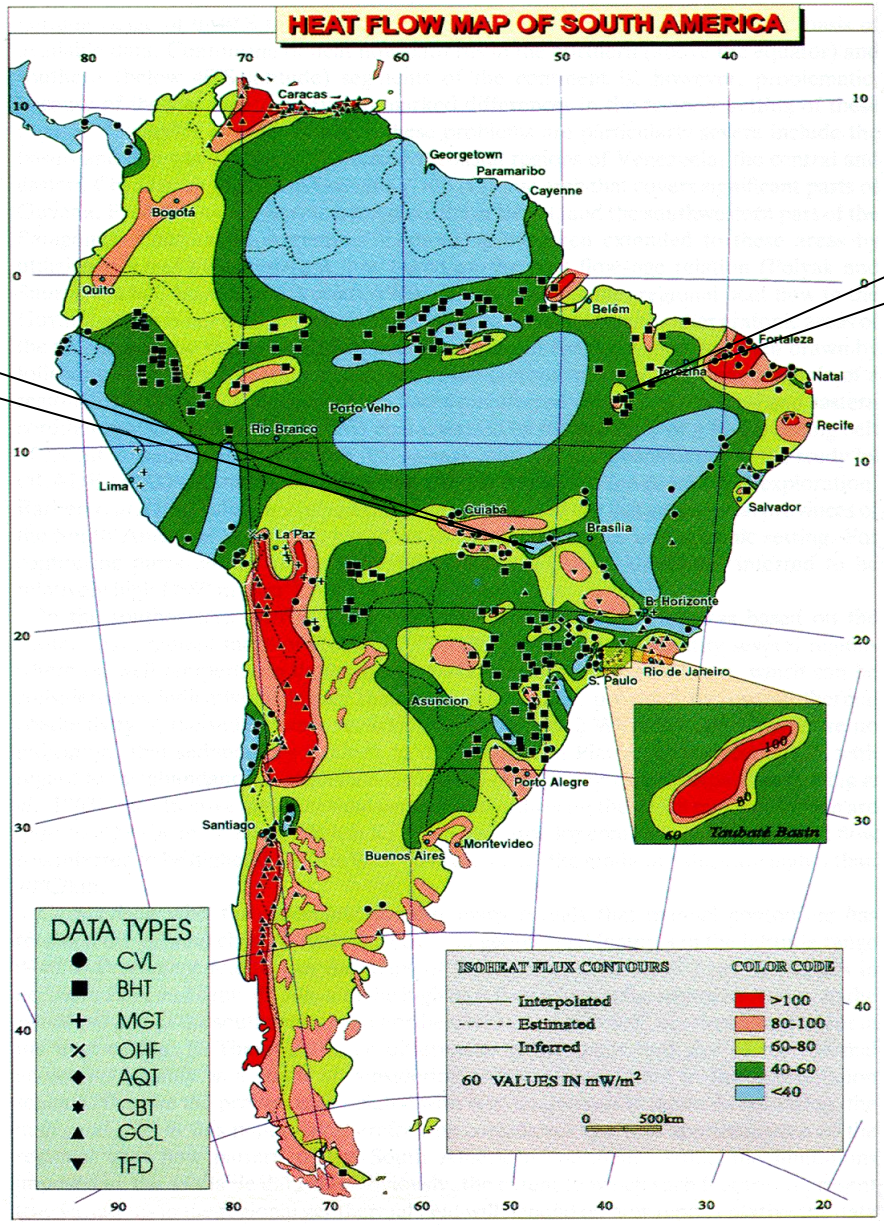
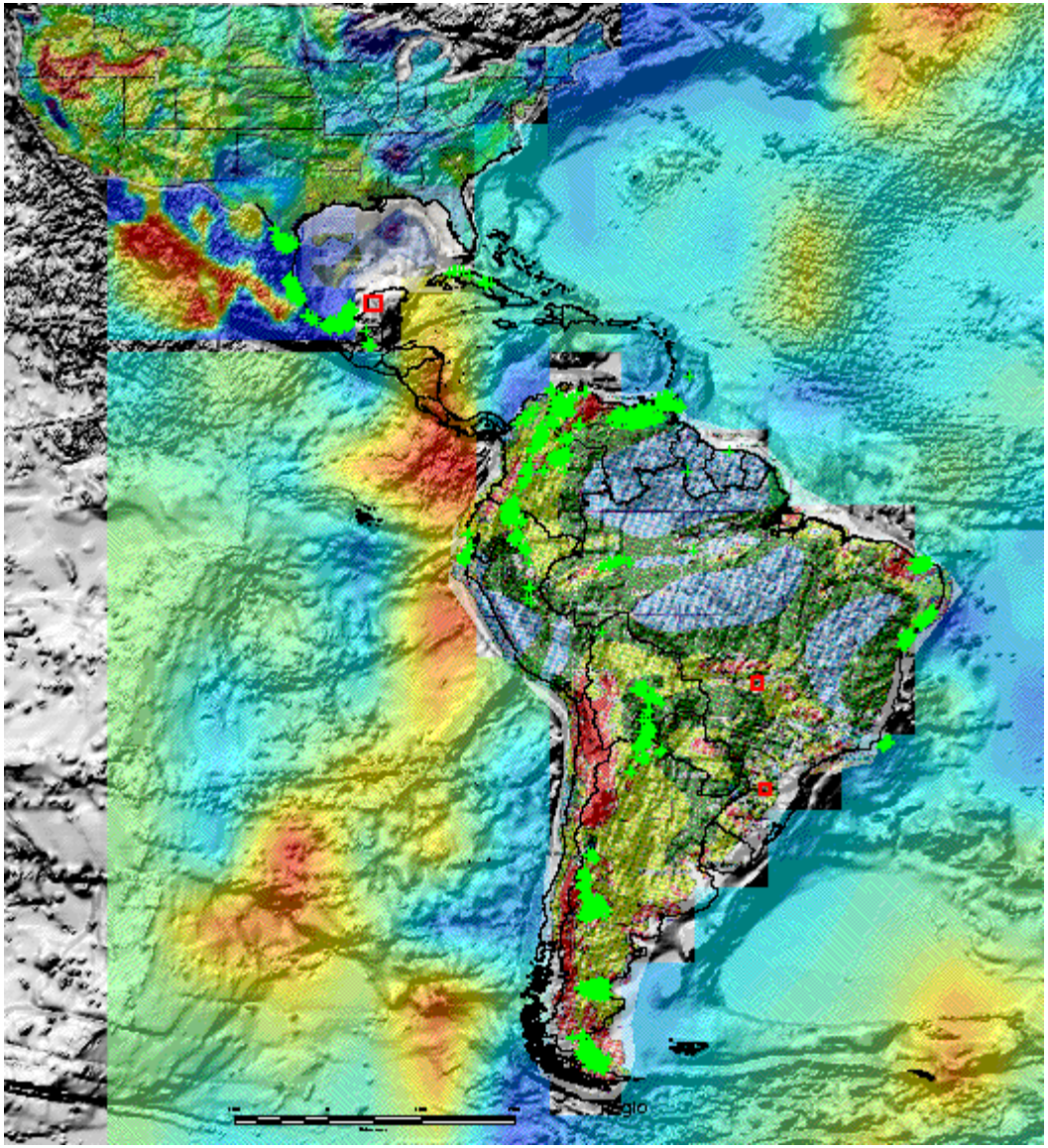


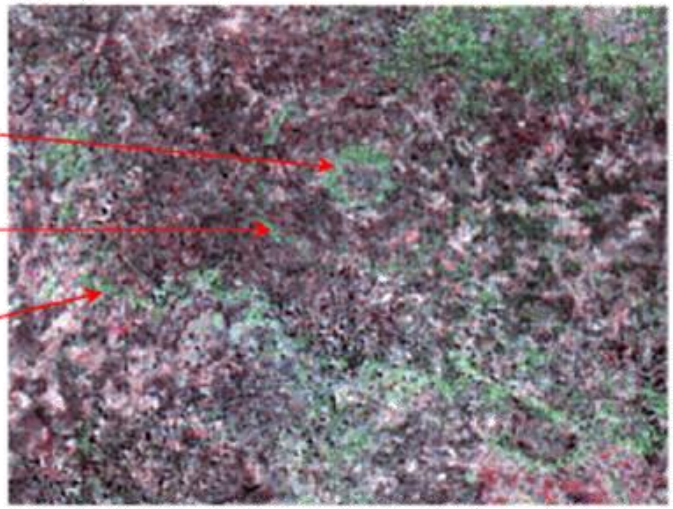
Araguainha Dome, Brazil. Diminished heat flow surrounded by spokes of elevated heat flow.

Riachao Ring exhibiting elevated heat flow surrounded by diminished heat flow.

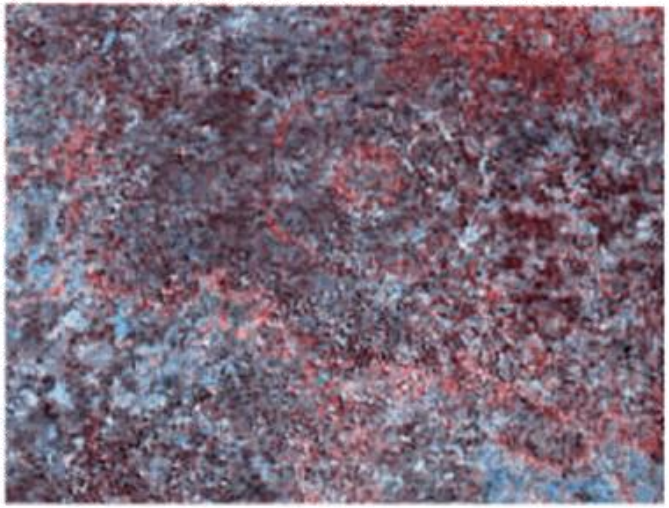
Heat flow map of South America with locations of selected impact craters.



Temperature Gradient, Degrees C / Km, Oil and Gas Fields, Selected Impact Craters. Index Map.

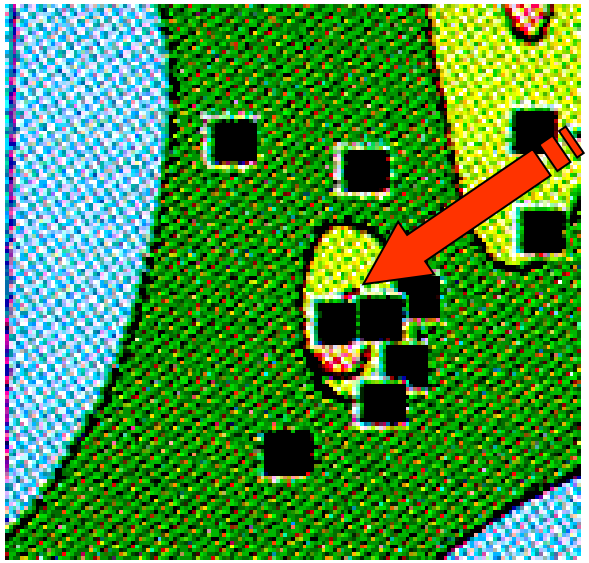


Araguainha Dome Impact Crater, Brazil. Complex, 40 km diameter crater, dated at 250 Ma. Landsat TM acquired 4/3/86. Bands 3, 4, 5.

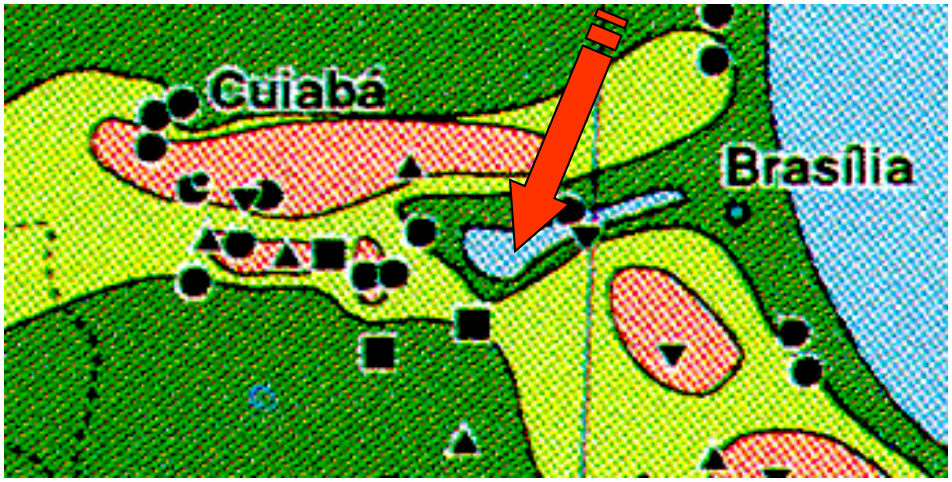


Landsat TM data acquired 4/3/86.

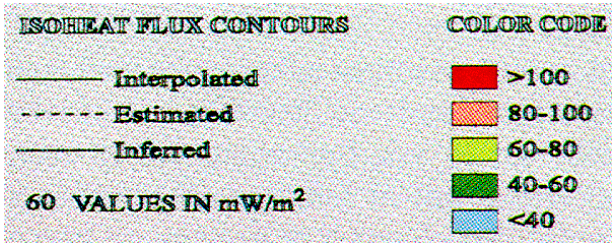
Araguainha Crater, Brazil, Landsat TM data.



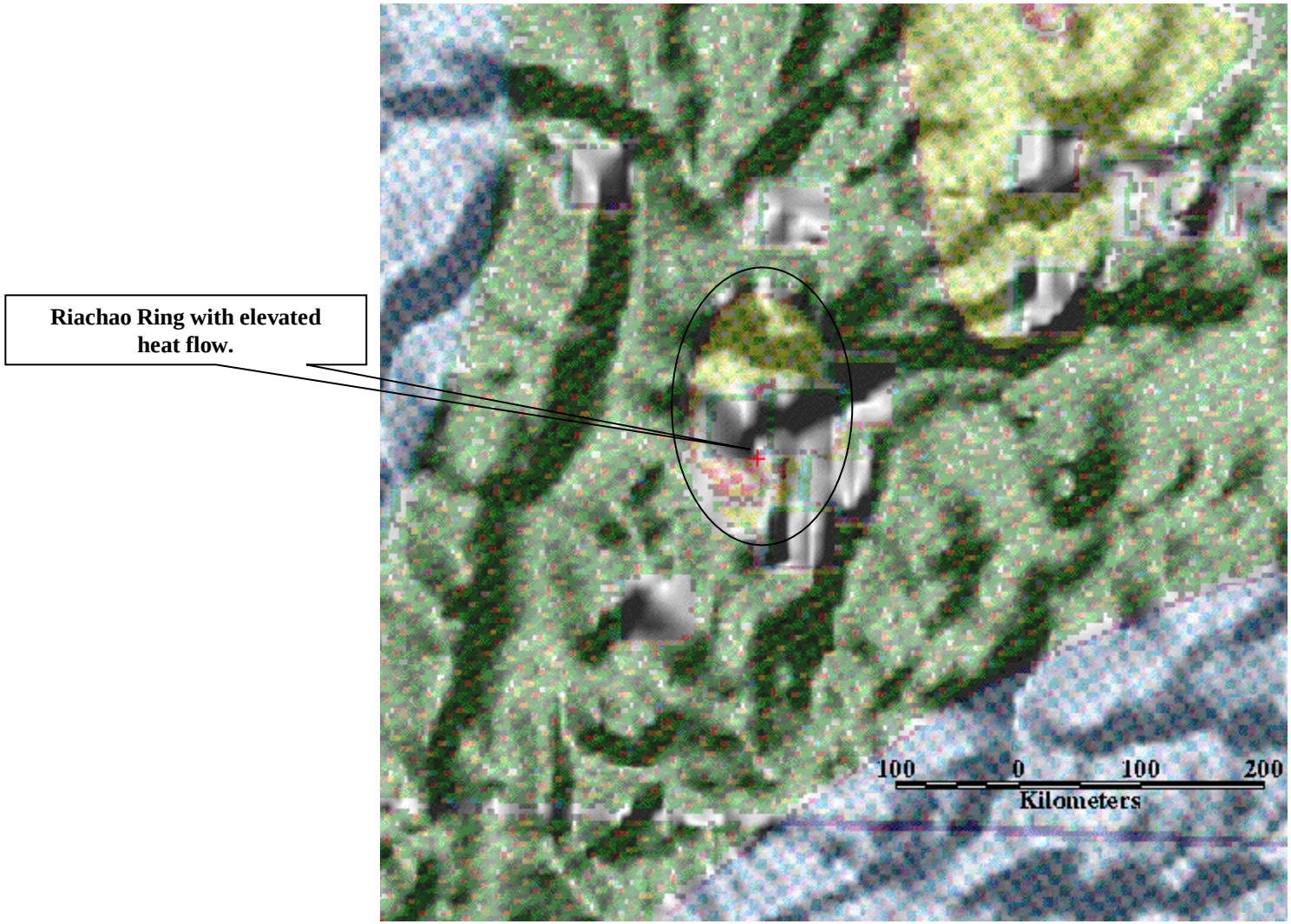
Riachao Ring exhibiting elevated heat flow surrounded by diminished heat flow.



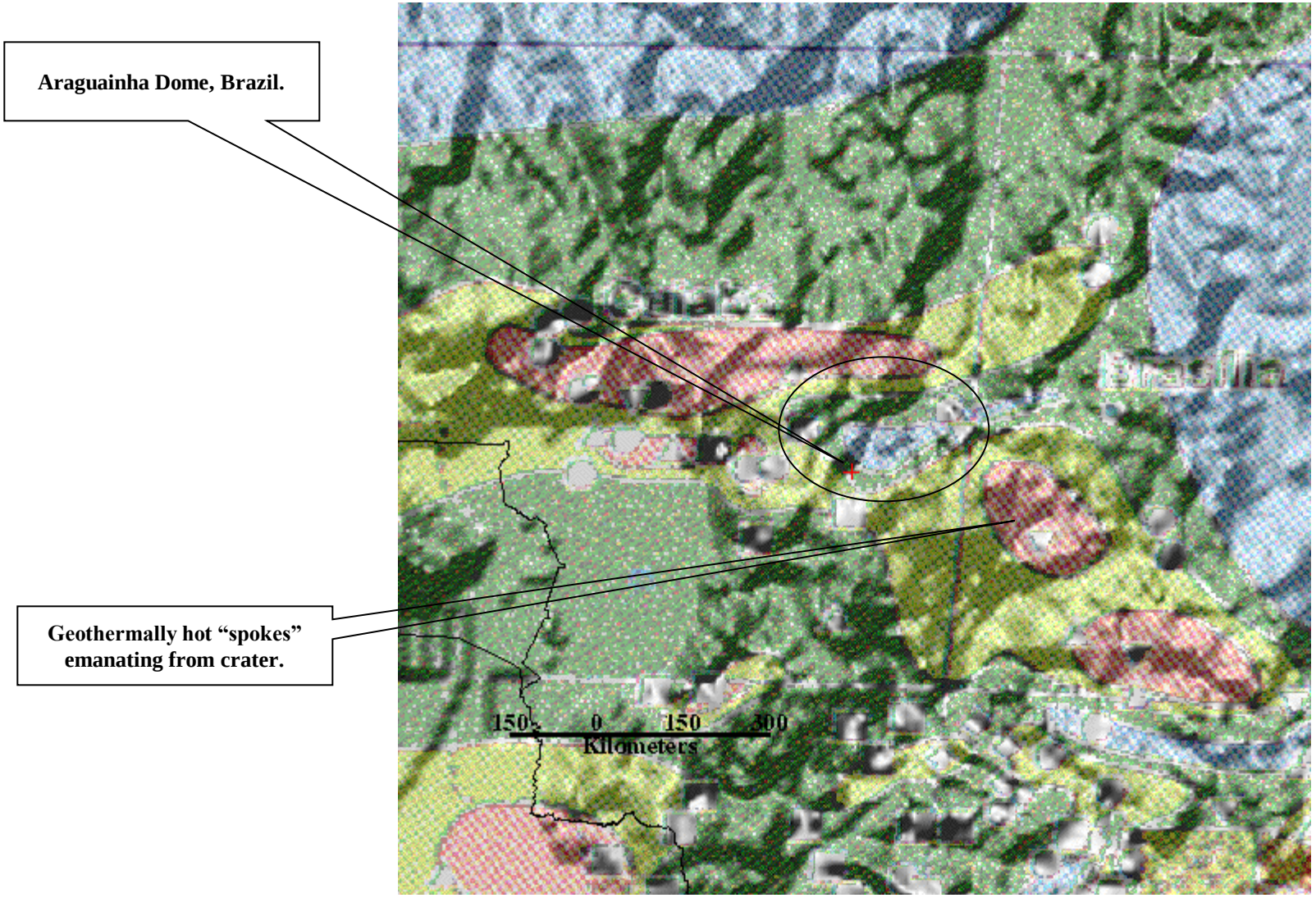
Araguainha Dome, Brazil. Diminished heat flow surrounded by spokes of elevated heat flow.



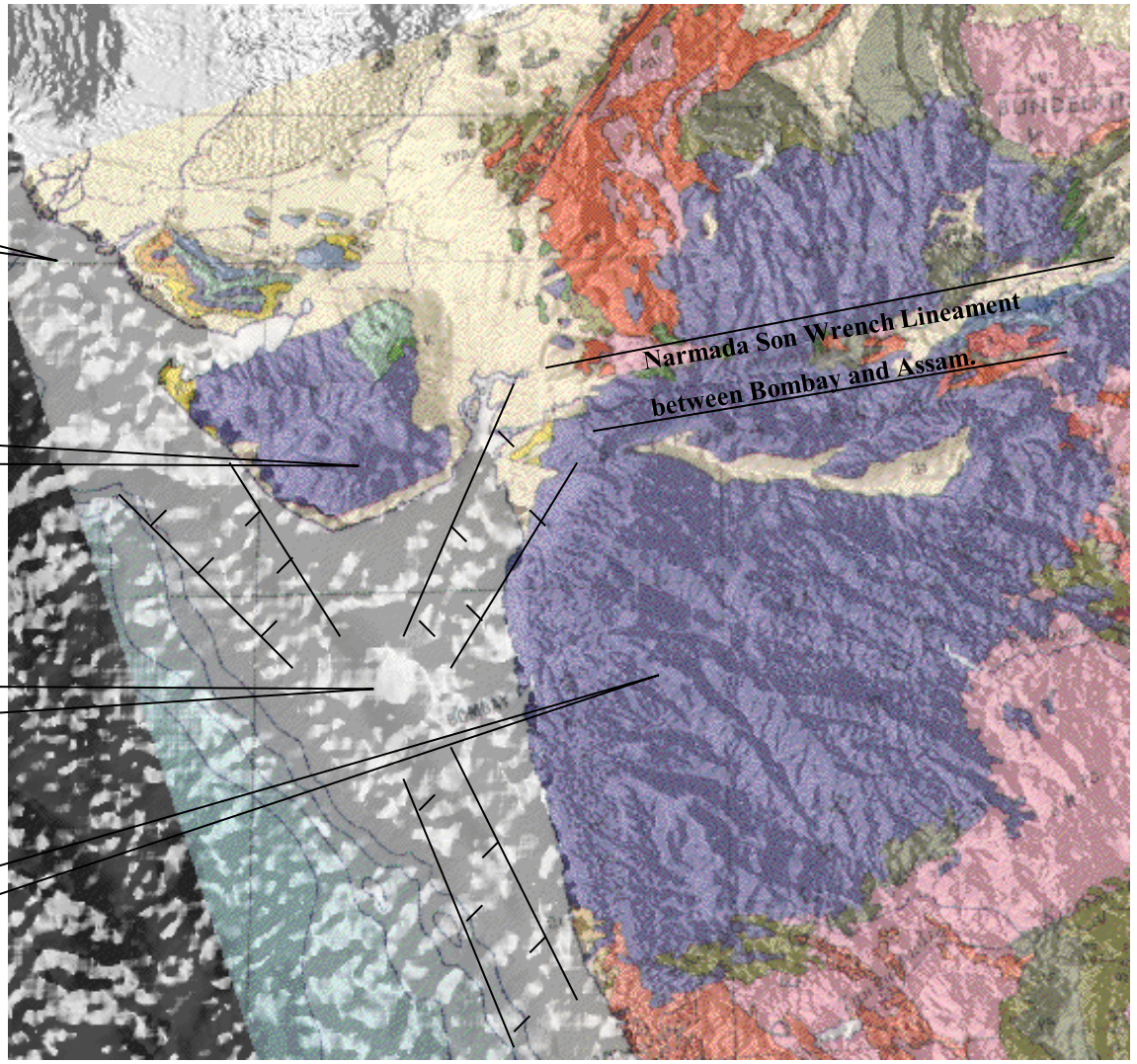
Heat Flow, Brazil.



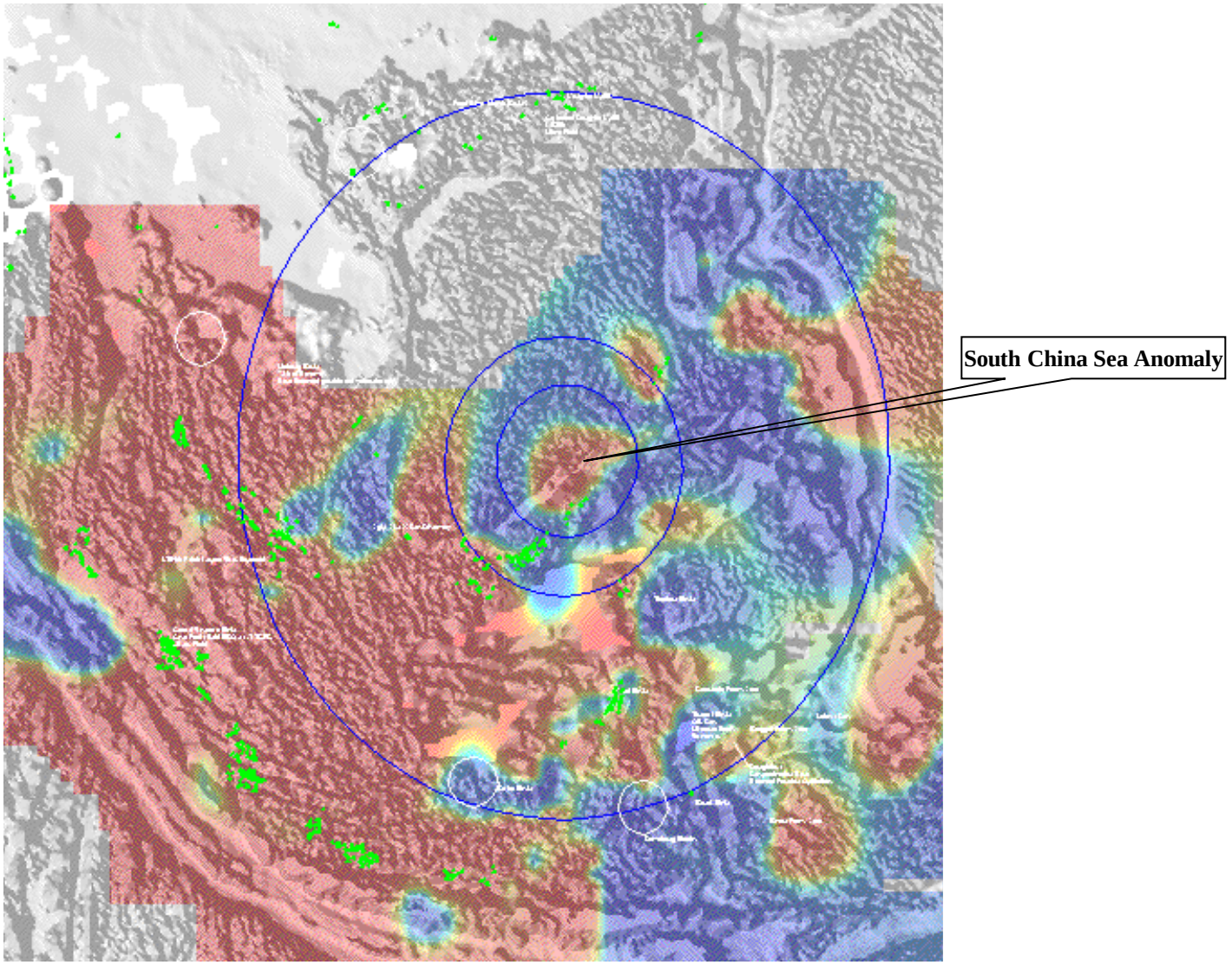
Riachao Ring Crater, 4.5 km diameter, 200 Ma. Note: crater coincides with basin that is geothermally hotter than the surrounding terrain.



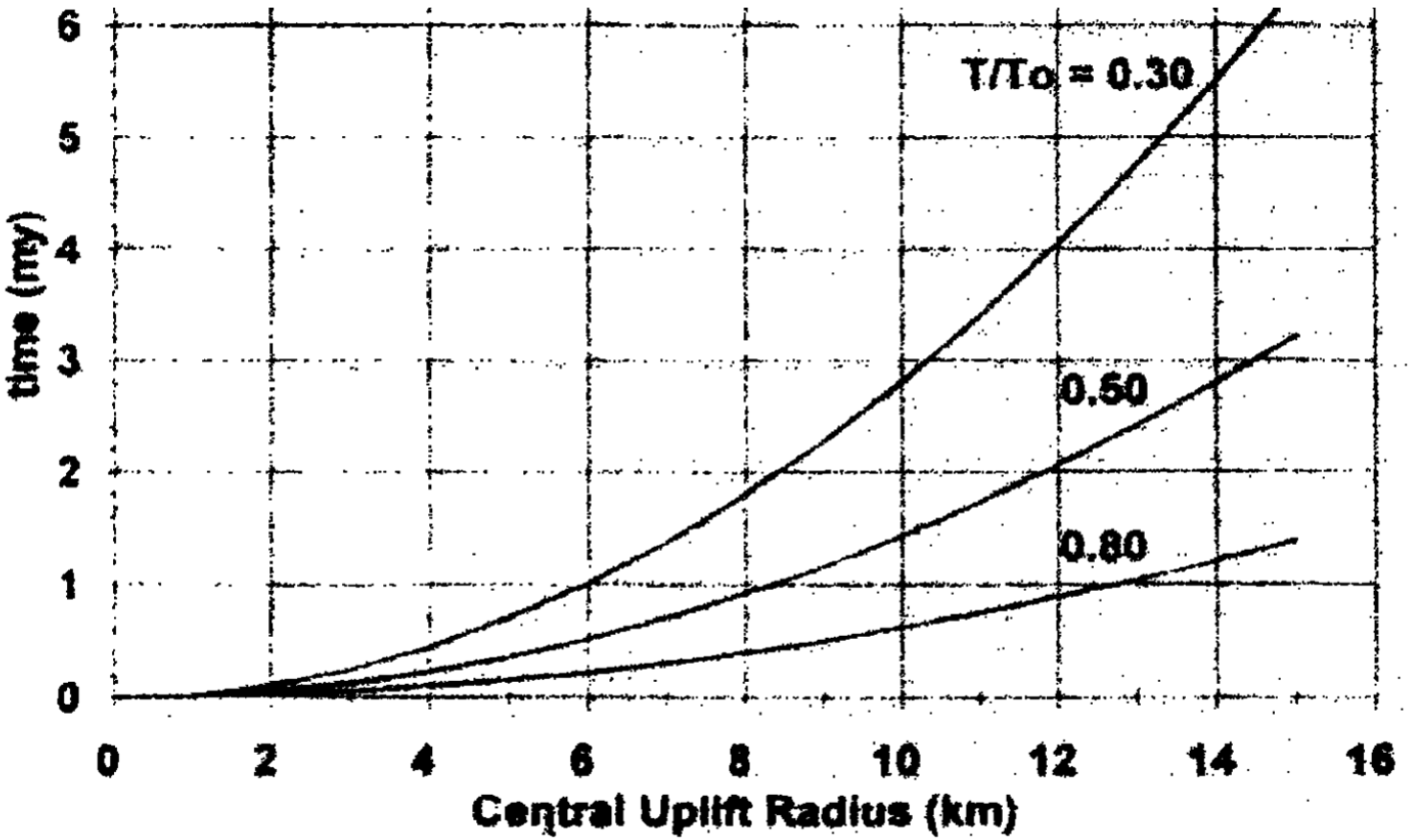
Araguainha Dome, Brazil. 40 km diameter, 250 Ma. Note cool basin with hotter spokes emanating from the center, similar to Bombay, India.



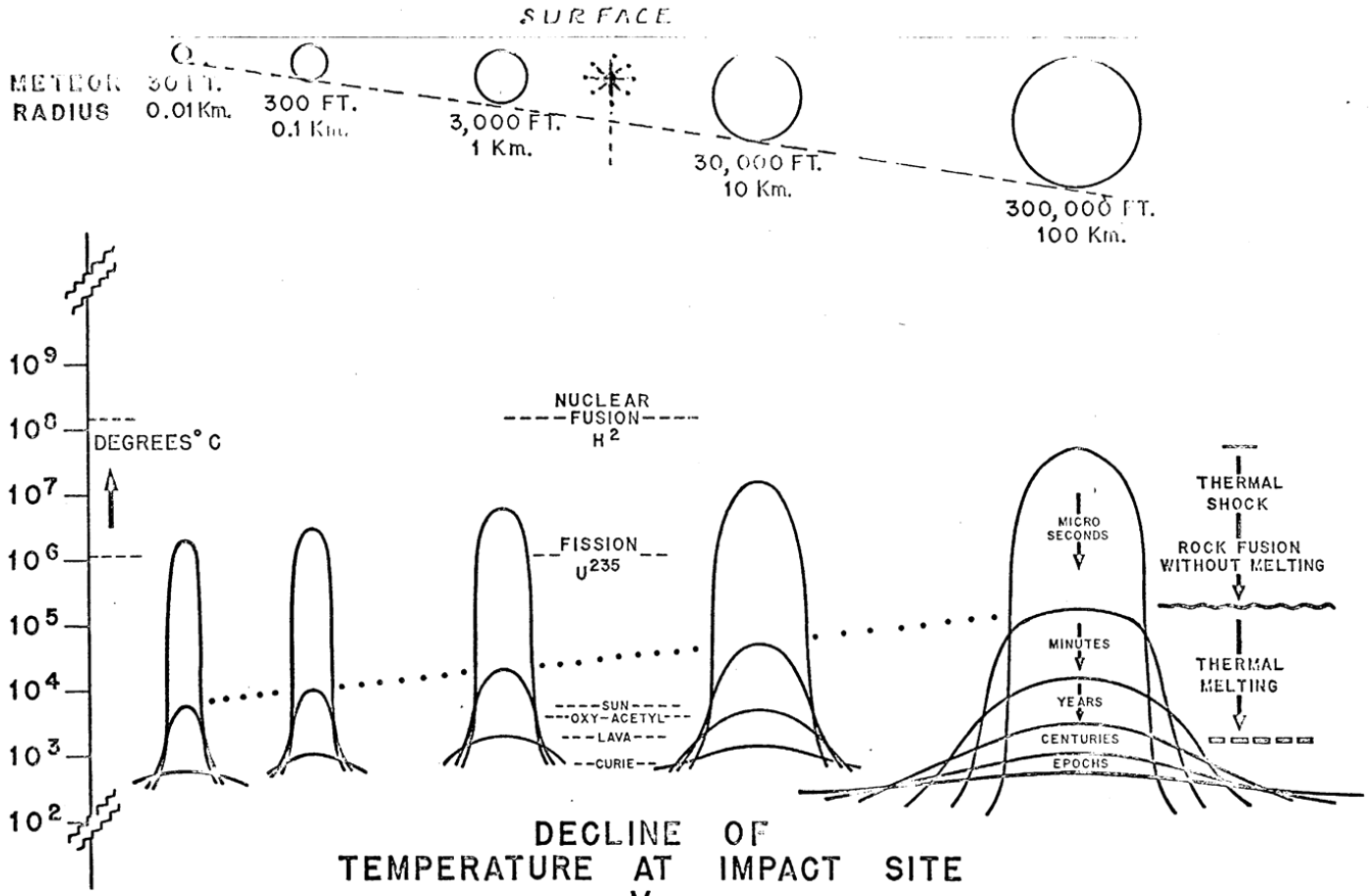
Geologic Map, Bombay Region, India, on shaded relief satellite gravity offshore and shaded relief topography onshore. The purplish Deccan Traps have long been compared with the impact-generated mare basalts on the moon. Note the potential impact center offshore--a circular gravity minima which has focused the majority of the oil and gas production in the area, including the 1.4 BBOE Bombay Field.



Geothermal gradient, Southeast Asia, superimposed over shaded relief bathymetry / topography, with oil and gas fields in green. Note high heat flow anomaly in the South China Sea (reds), as well as encircling, alternating, low (blues) and high heat flow areas towards onshore Java, Sumatra, Gulf of Thailand, and the Philippines (Buthman, 1999).



Conductive model, from Crossey, et al, 1998. Shows time required for various degrees of cooling as a function of central uplift radius. T/To is temperature T relative to initial temperature To.



DECLINE OF
TEMPERATURE AT IMPACT SITE
Vs
TIME
Vs
METEOR SIZE