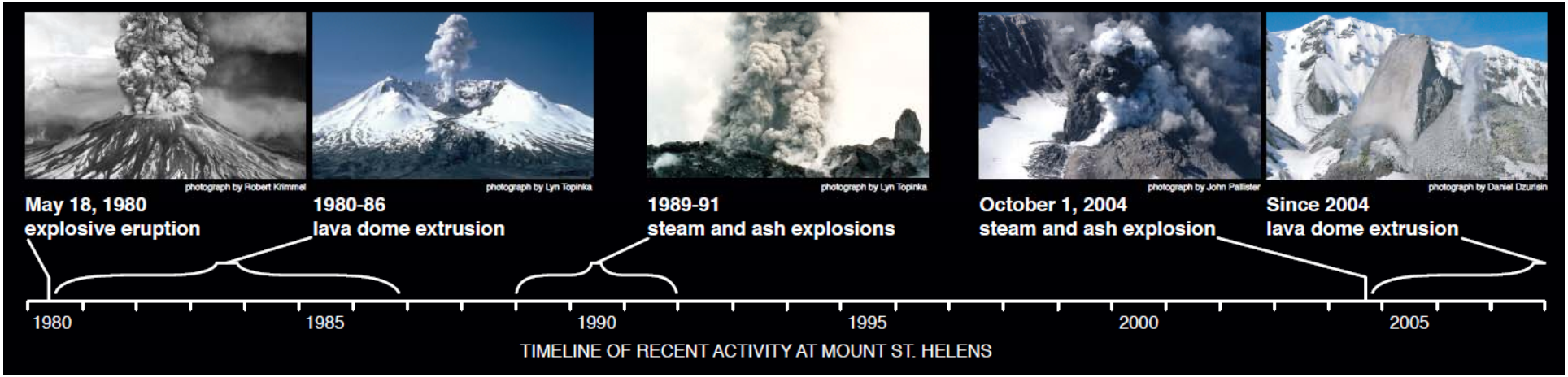
Volcanic Deformation and Evolution of Mt. Saint Helens



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A. Digital perspective view derived from USGS Digital Elevation Model (DEM) of Mount St. Helens as seen from the northwest prior to the catastrophic eruption of May 18, 1980. Created with Geographic Information Systems (GIS).

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B. Digital perspective view derived from USGS DEM of Mount St. Helens following the catastrophic eruption of May 18, 1980. The 1980-86 lava dome has begun growing in the center of the crater.

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C. Light Detection And Ranging (LIDAR)-derived digital perspective view of the volcano on September 22, 2003, one year before the start of its latest eruption. The 1980-86 lava dome and Crater Glacier occupy the crater.

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D. Digital perspective view derived from both LIDAR DEM and DEM constructed by photogrammetric techniques, showing new lava dome, 1980-86 dome, and advancing Crater Glacier on July 5, 2007.

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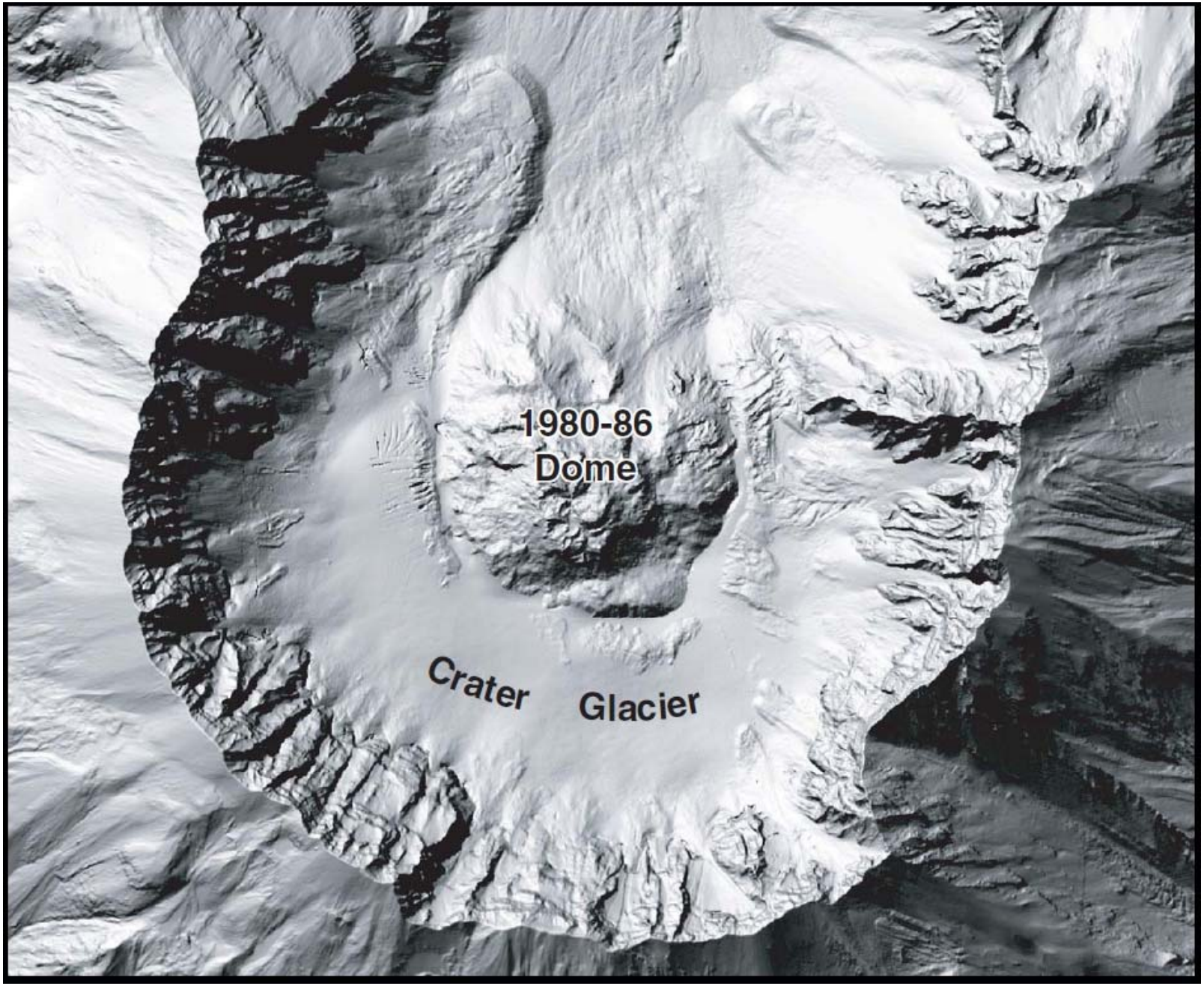
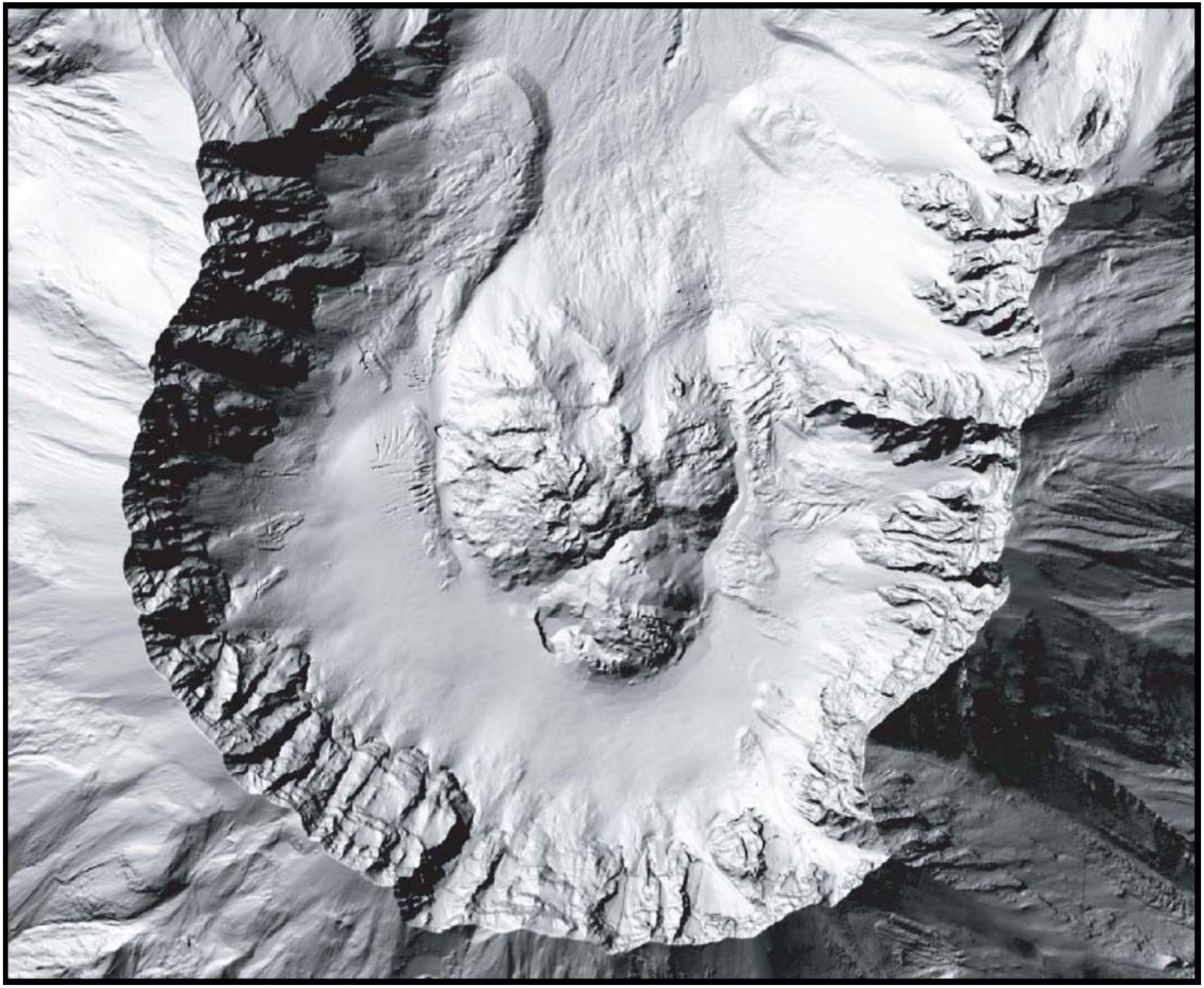


September 22, 2003: A lava dome about 80 million cubic meters in volume grew in the center of Mount St. Helens' crater from 1980 to 1986. Crater Glacier grew between the dome and the high south crater walls and formed tongues of ice around the east and west sides of the dome. In 2003, the glacier was as much as 200 meters thick and continued to grow. The volcano was relatively quiet during this period. http://pubs.usgs.gov/sim/2006/2928/



October 4, 2004: After 18 years of relative quiescence, Mount St. Helens reawakened in September 2004 as swarms of small earthquakes began in and beneath the 1980-86 lava dome. As magma rose toward the surface, a broad welt formed as parts of the 1980-86 lava dome, crater floor, and glacier deformed. Solid, hot lava reached the surface on October 11, 2004. http://pubs.usgs.gov/sim/2006/2928/

February 21, 2005: By early 2005, the new lava dome had pushed southward to form a smooth "whaleback" structure (see photo below left) and was building at a rate of around 2 to 3 cubic meters (one small dump truck load) per second. By February, the dome had grown to over one-half the total volume of the 1980-86 lava dome and began pushing eastward, bulldozing the east arm of the glacier.

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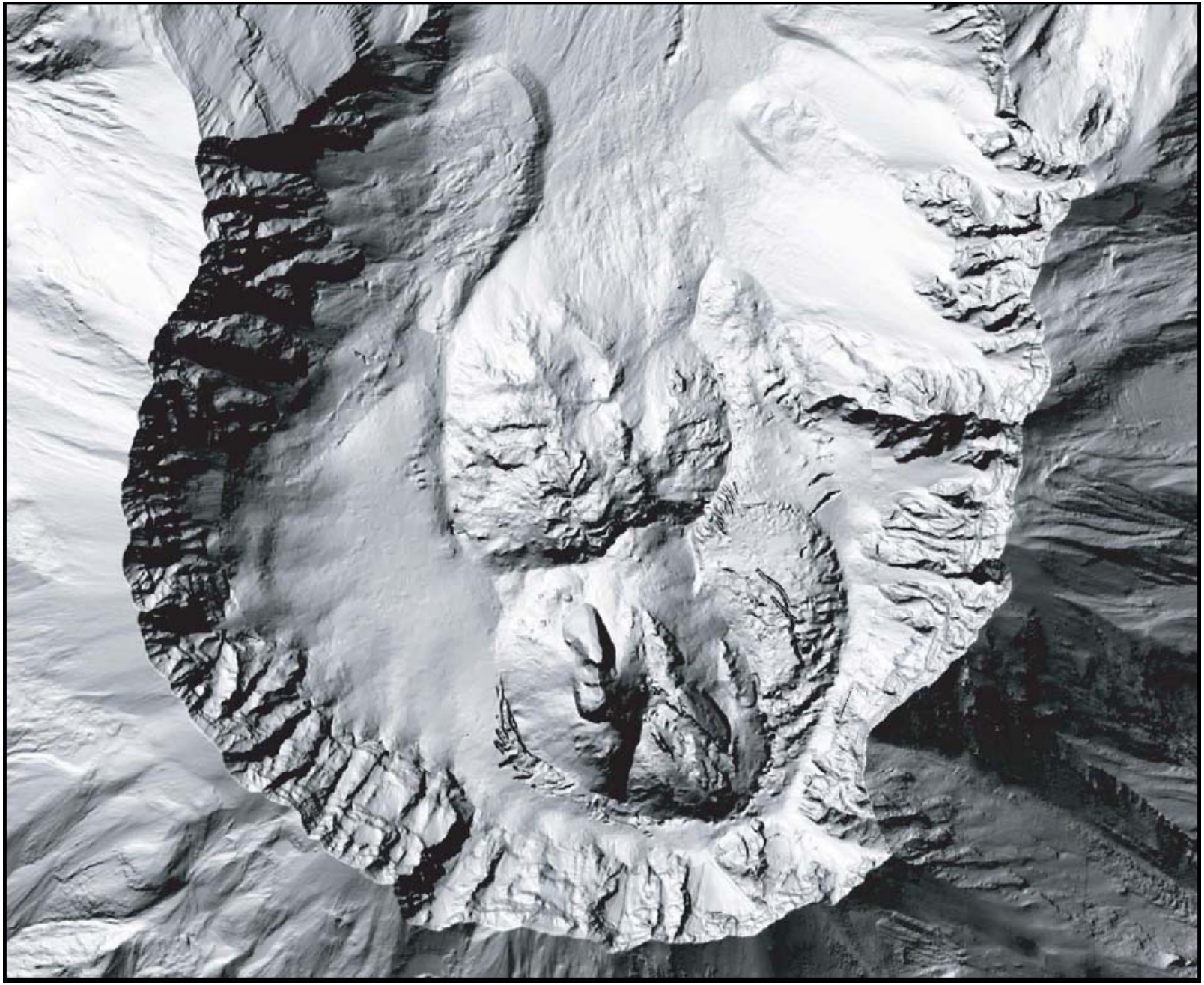

July 14, 2005: Almost 60 million cubic meters of new rock had been extruded by mid-July 2005. The "whaleback," visible in early 2005, had cooled and broken apart. A tall spine was extruded, attaining a height of 2,368 meters, just 2 meters short of the lowest point on the crater rim. This spine later crumbled.

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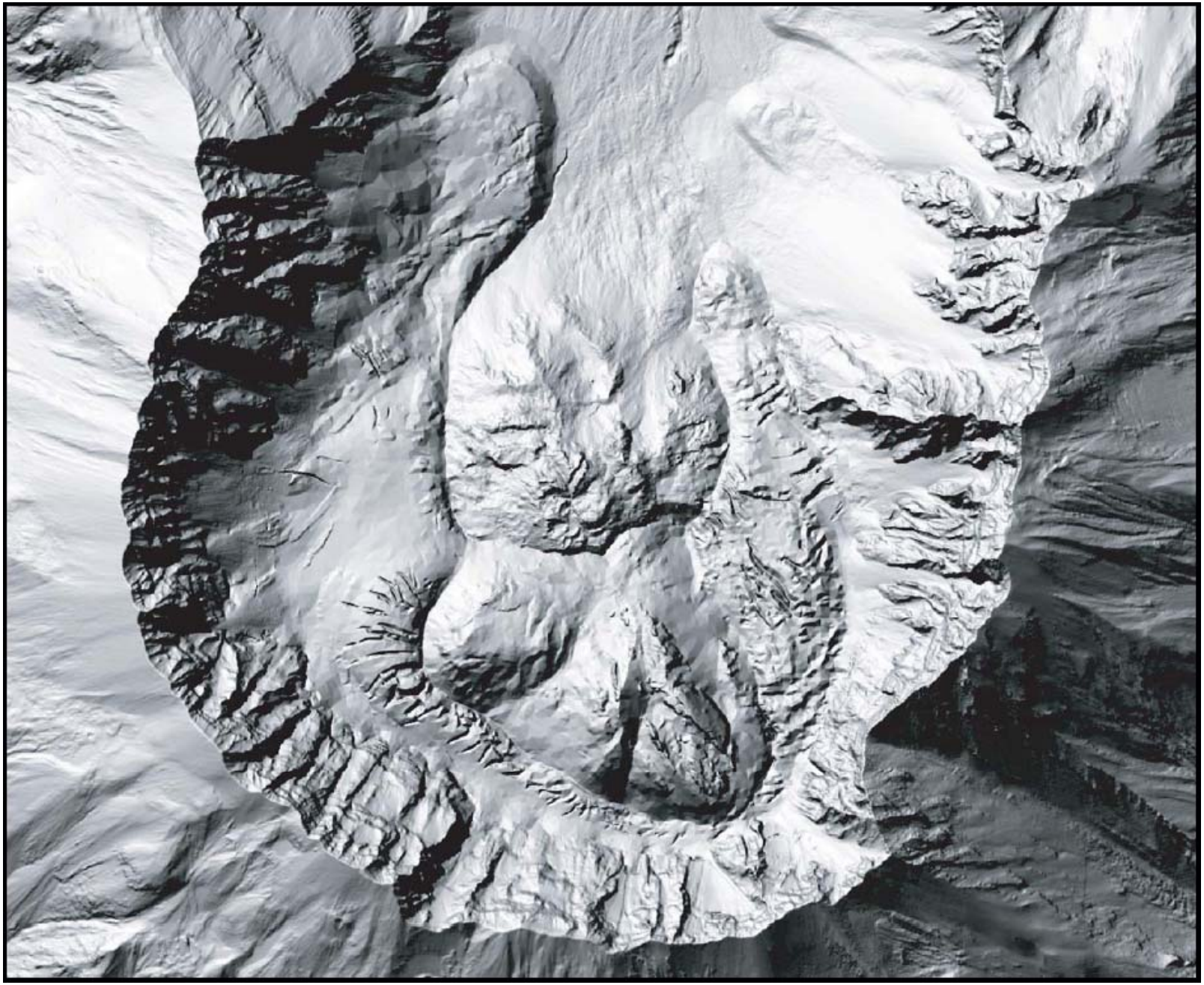

October 24, 2005: Over one year had passed since the eruption began. During this time, the new lava dome had started pushing to the west, where it deformed and severely cracked the west arm of the glacier. The volume of new rock extruded was about 70 million cubic meters.

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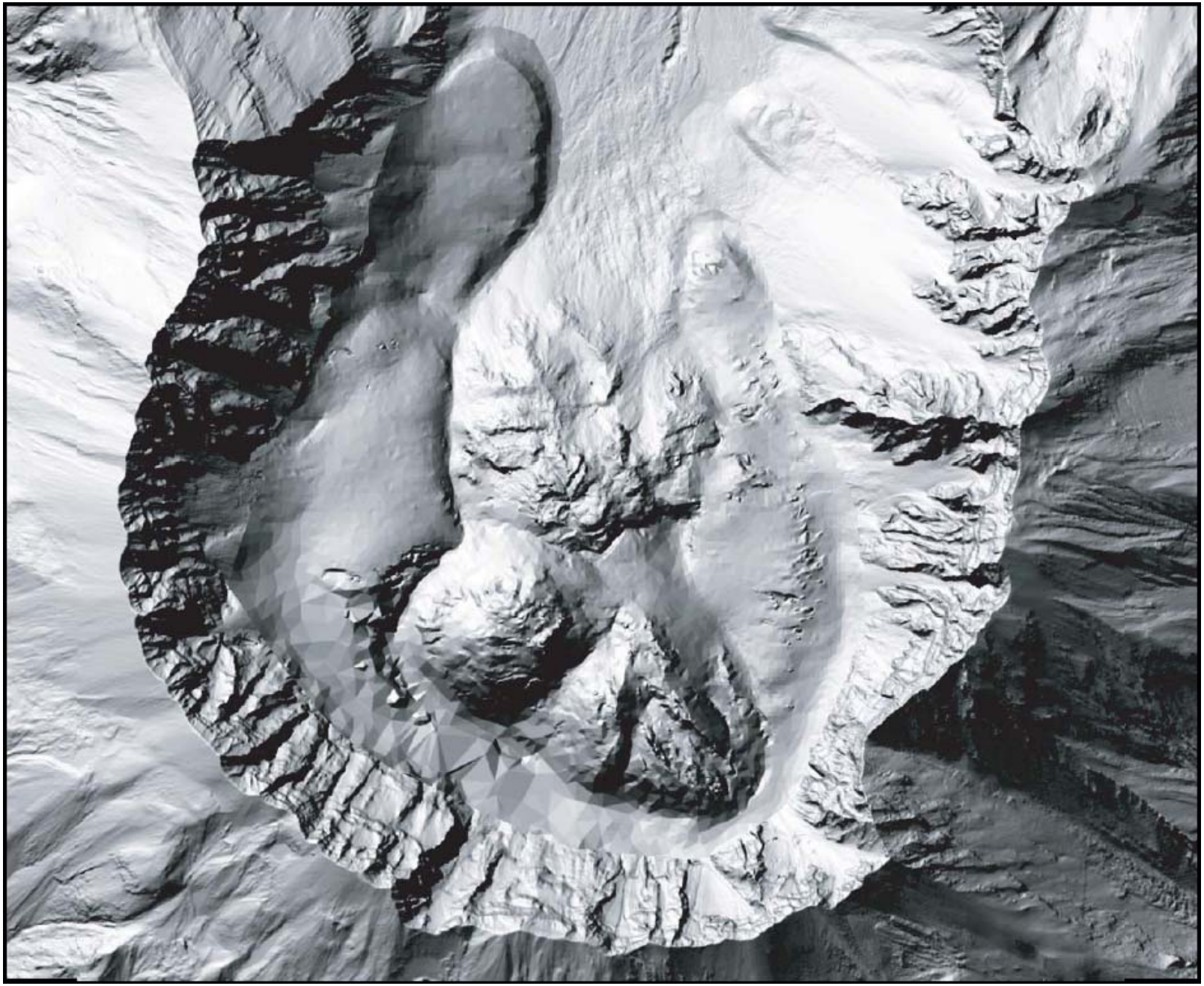

February 9, 2006: The new lava dome continued to rise and push westward. A massive fin of hot lava projected skyward (see photo below right), rising at a rate of nearly 2 meters per day. The dome had built to a volume roughly equal to that of the 1980-86 lava dome.

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New lava dome exhibiting “whaleback” form as seen from the northwest on February 23, 2005. The 1980-86 lava dome is visible in the lower left corner. Dome growth severely cracked and deformed the east arm of Crater Glacier, visible to the left of the new dome

Actively growing fin of lava as seen from the 1980-86 lava dome on April 28, 2006. Fin is about 100 meters tall *(Photograph by Daniel Dzurisin).*

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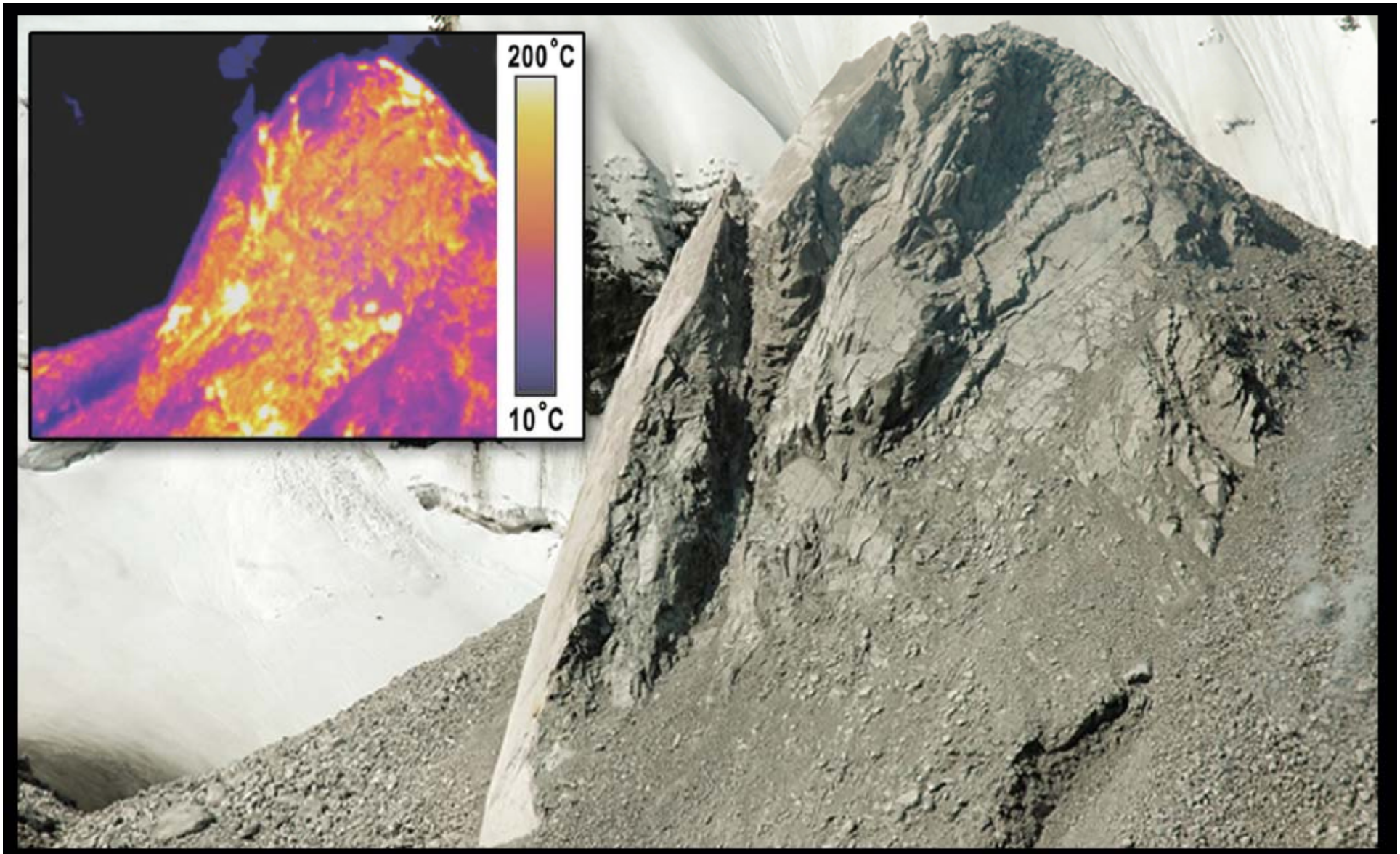

Hot fin of lava rising from growing lava dome on May 30, 2006. Forward Looking Infrared (FLIR) image shows rock temperature. (Photograph by William E. Scott, FLIR by James W. Vallance).

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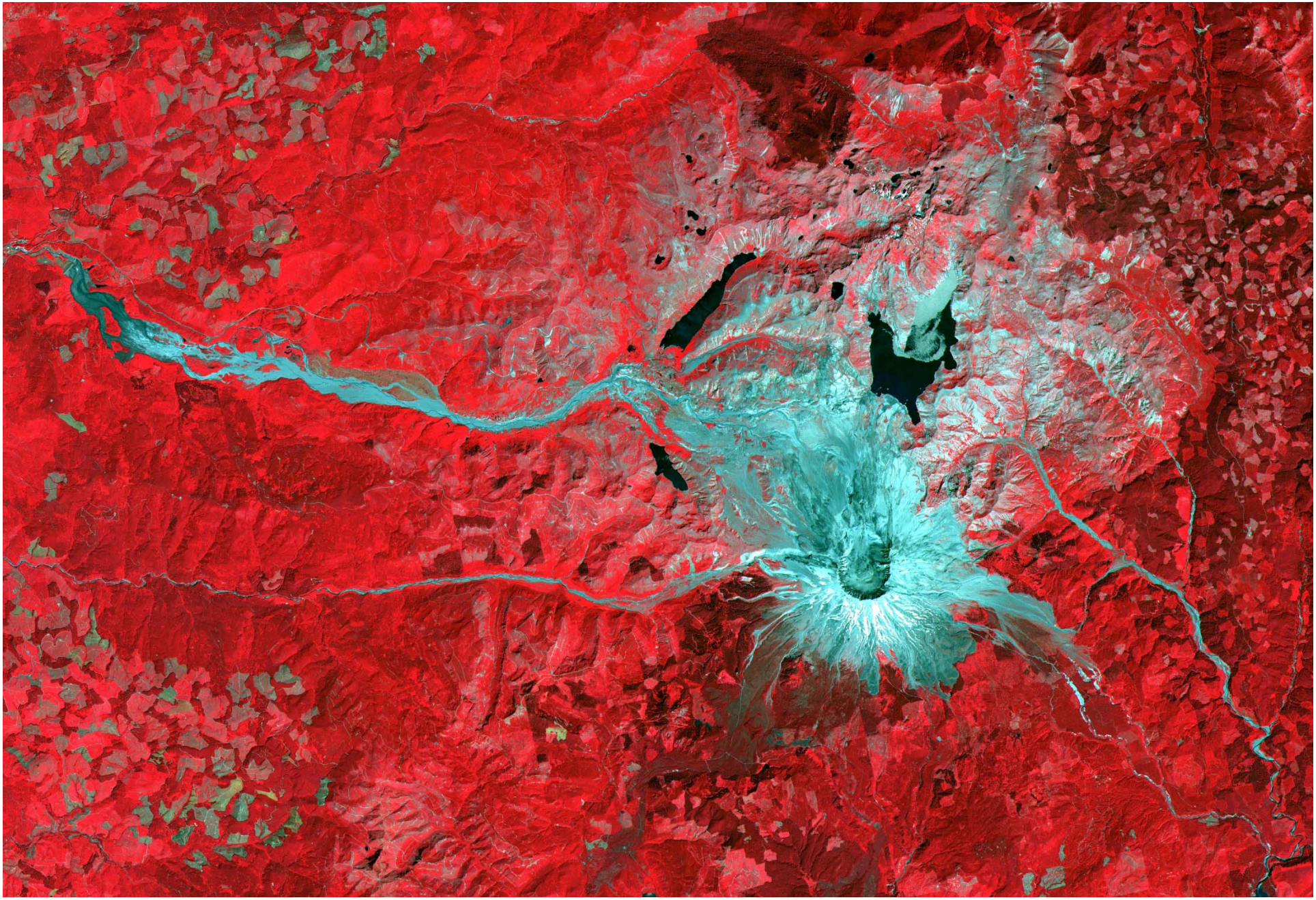
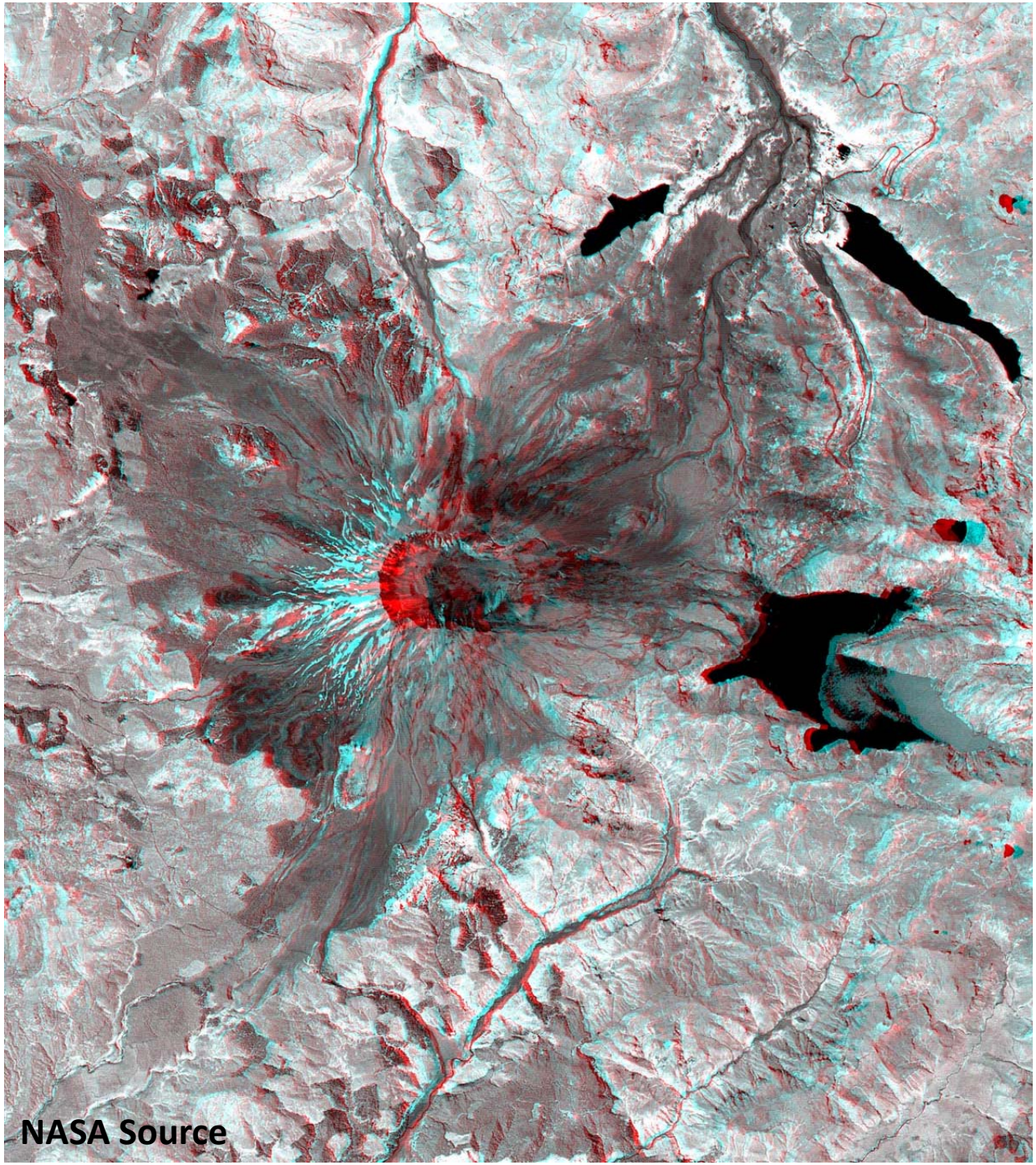


NASA Source ASTER image of Mt. St. Helens volcano in Washington. Vegetation is colored Red.

http://www.fs.fed.us/gpnf/mshnvm/education/teachers-corner/library/nasa-aster-series.shtml

This 3-D anaglyph image of Mt. St. Helens volcano.

Use 3D glasses!



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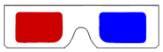

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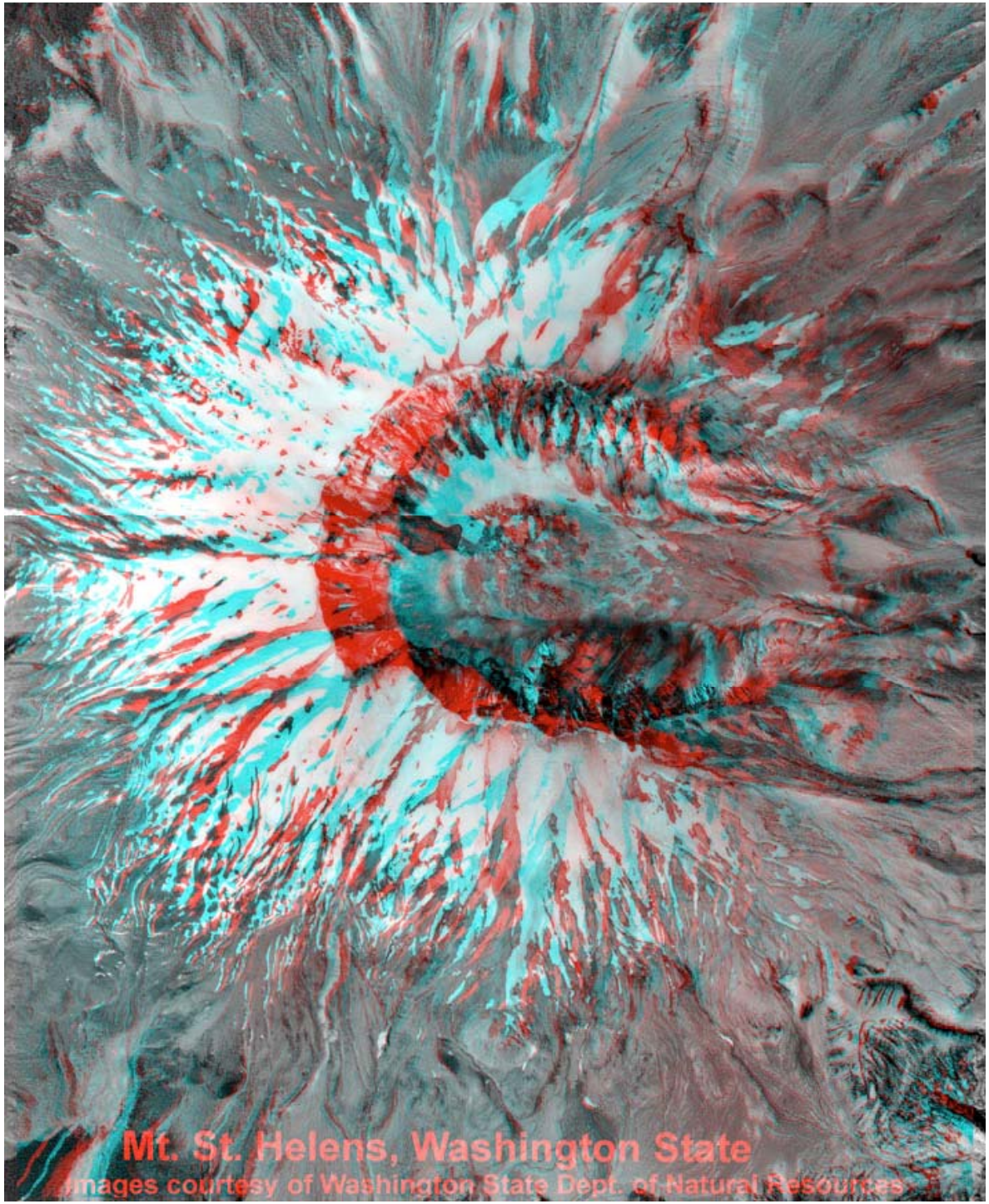
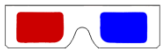


http://www.dnr.wa.gov/SiteCollectionImages/Places/ger_msh_anaglyph175.jpg



Mt. Saint Helens Resources

A Volcano Rekindled: The Renewed Eruption of Mount St. Helens, 2004–2006
http://pubs.usgs.gov/pp/1750/

Rebuilding Mount St. Helens
http://pubs.usgs.gov/sim/2006/2928/

A New Perspective on Mount St. Helens—Dramatic Landform Change and Associated Hazards at the Most Active Volcano in the Cascade Range
http://pubs.usgs.gov/sim/3008/

Historic Digital Elevation Models (DEMs)
http://ned.usgs.gov/Ned/historic.asp

USGS Fact Sheet: Mount St. Helens – From the 1980 Eruption to 2000
http://pubs.usgs.gov/fs/2000/fs036-00/

Geologic Map of the Sasquatch Steps Area, North Flank of Mount St. Helens, Washington
http://geopubs.wr.usgs.gov/i-map/i2463/

360 ° Panoramic View of Mount St. Helens Crater
http://www.panoramas.dk/fullscreen6/f34-Mt-St-Helens.html

Teacher's Corner – Mt. Saint Helens National Volcanic Monument
http://www.fs.fed.us/gpnf/mshnvm/education/teachers-corner/library/nasa-aster-series.shtml

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