CORRELATION OF MAJOR TOPOGRAPHIC LINEAMENTS IN THE NORTH CAROLINA BLUE RIDGE WITH REGIONAL FRACTURE ZONES

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Study Area
Study Area
Study Area

Western North Carolina
Study Area

Laurel Creek

Swannanoa
Fracture zones, faults, or something else?

- structural origin of the topographic lineaments
  - type of structures?
  - connection to outcrop-scale fractures?
  - seismogenic?
  - how old?
Earlier work

- Hadley and Nelson (1971)
  - R-lateral fault
  - has been revised
Earlier work

- Robinson et al. (1992)
  - R-lateral fault has been removed
Earlier work

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Earlier work

- Hack (1982)
  - Described and named several lineaments
  - “…differential erosion along brittle fracture zones associated with older faults.”

- Merschat (1997) “…result of jointing, fracturing, and faulting across different rock types”
Earlier work – Canton, NC
Earlier work – Canton, NC

Fractures along Swannanoa lineament

(Joint data from outside lineament from Merschat and Wiener, 1988)
Post-Orogeinic Structures

- There are two sets of lineaments—
  - E-W and SE-NW
  - cross Paleozoic faults; must be post-orogenic

Source: USGS
Post-Orographic Structures

- lineaments transect the regional structural trend at different orientation
- cross Paleoozoic rocks; must be post-orogenic

Source: NCGS, 2007
Recent earthquake activity: 1980 - 2012

Source: USGS, 2007
Results 1623 fracture measurements from 98 outcrops within lineaments
Results

1623 measurements from 98 outcrops within lineaments

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All lineament data
Results – all lineament data

n=1623
Results

13910 NCGS fracture measurements from Blue Ridge of western NC

n=13910
Results – NCGS fracture data

NCGS data

Frequency

strike

n=13910
Results – NCGS fracture data
Results – comparative analysis

All new lineament data

NCGS data
Paleostress inversion – Canton, NC

There is *a priori* knowledge that these are dextral normal faults based on a “stepping-up” texture on the footwall.
The best fit stress tensor has a max compressive stress that is close to vertical, which agrees with the *a priori* knowledge that these are dextral normal faults. $\Phi = 0.244$
World stress map
Regional- and outcrop-scale correlation

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Conclusions:

- E-W topographic lineaments in western NC are associated with E-W outcrop-scale fractures and minor faults.

- Outside the lineaments outcrop-scale fractures strike NW-SE and NE-SW.

- Paleostress tensor from a minor fault set in the Swannanoa lineament is incompatible with modern-day stress field, although the lineaments appear to be seismogenic.

- Doming and N-S extension due to isostatic rebound following erosion.
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