RELATIVE AGES OF GRABEN AND WRINKLE RIDGES ON THE NEARSIDE OF THE MOON REVEAL CONTRADICTORY RELATIONSHIPS. A. L. Nahm[1], A.-K. Dudde[2], and E. Hauber[1], [1]Institut für Planetenforschung, German Aerospace Center (DLR), Rutherfordst. 2, 12489 Berlin, Germany, amanda.nahm@dlr.de, ernst.hauber@dlr.de; [2]Nelson Mandela School, Pfalzburger Str. 30, 10717 Berlin, annakatharinadudde@yahoo.com.

Introduction: Crosscutting relationships are used to determine the relative ages of geologic units or structures such as faults. Understanding the relative ages of events is critical to understanding the geologic history of a region or a planetary body. Understanding the tectonic history of the Moon, particularly the timing of fault formation, provides crucial constraints on the evolution and sources of stress.

Tectonic activity on the Moon is exhibited by three morphologies: graben, wrinkle ridges (WR), and lobate scarps. Contractional deformation, likely from global contraction and mare subsidence, is hypothesized to postdate extensional deformation, effectively 'shutting off' normal faulting on the Moon [e.g., 1, 2]. The current understanding of lunar tectonics indicates that graben formation/extensional deformation ceased around 3.6 Ga [3], though the individual normal fault known as Rupes Recta formed ≤ 3.2 Ga [4]. In contrast, contractional deformation in the form of wrinkle ridges and lobate scarps appears to have continued until ~1.2 Ga [2] and <1 Ga [e.g., 2, 5, 6].

Based on this information, crosscutting relationships between wrinkle ridges and graben are expected to consistently show graben to be older than wrinkle ridges. However, rare crosscutting relationships indicate that wrinkle ridges are both older [e.g., 7] and younger than the graben [1]. Unfortunately, no list or compilation of the locations of these crosscutting relationships exists in the literature against which the timing can be compared. Thus, we have assembled a list of locations of crosscutting relationships along with interpretations of the sequence structural deformation (Table 1).

Discussion: The locations of 33 crosscutting interactions have been catalogued and are listed in Table 1. In general, ~60% of observed interactions show graben are older than wrinkle ridges, consistent with the summary given above. However, in five cases, the wrinkle ridges appear to be older than the graben. Thus, graben and wrinkle ridge formation may have been contemporaneous for at least a portion of the geologic history of the Moon, or graben and wrinkle ridge formation were temporally distinct. This is supported by the timing of wrinkle ridge formation (ending ~1 Ga, but may have begun ~4 Ga [8, 9]), as well as the observations provided here. At the very least, these results indicate that the canonical view of lunar tectonics (that is, graben formed before wrinkle ridges) is overly simplistic and warrants a detailed investigation of these interesting structures.

Table 1. Catalog of observed crosscutting relationships between graben and wrinkle ridges.

Relationship Type	Approx. center long.	Approx. center lat.
Graben older	-25.72	45.77
	-25.34	45.90
	-25.02	34.96
	26.05	42.91
	38.76	34.85
	29.07	24.66
	27.71	9.19
	38.14	8.63
	48.56	8.44
	39.53	7.68
	21.44	4.62
	-20.02	-6.88
	-46.49	-8.78
	-45.02	-24.14
	-27.18	-32.43
	30.03	-0.60
	29.17	25.14
	25.87	18.19
	43.78	-8.53
	26.88	37.46
Uncertain	28.53	36.36
	8.07	7.91
	7.70	8.75
	-44.91	-11.47
	-44.85	-22.06
	-28.58	-31.90
	38.76	-13.96
	4.13	19.11
Wrinkle ridges older	-0.12	15.14
	-44.64	-26.40
	24.66	16.68
	24.04	17.98
	26.89	37.37

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