

**Preliminaries**

Answer questions on right; then put an "X" beside it on left IF any answer is a possible shortcoming

<input type="checkbox"/>	Level of measurement	<input type="checkbox"/>	All variables scalar? Y/N	<b>Consult textbook</b>
<input type="checkbox"/>	Absolute minimum # var	<input type="checkbox"/>	Absolute minimum #	<input type="checkbox"/> What we have
<input type="checkbox"/>	STV ratio	<input type="checkbox"/>	What is our STV ratio?	
<input type="checkbox"/>	Min # observations	<input type="checkbox"/>	Ideal minimum	<input type="checkbox"/> How many we have
<input type="checkbox"/>	Normalcy	<input type="checkbox"/>	Number of chemicals with skews $\geq 1$	

**First Look at Output**

How many components were extracted using the  $\geq 1$  eigenvalue default standard?

What's the number of components to the left of the scree plot nick point?

Are these two measures of extraction the same or no more than one component off? Y/N

**Rotated Output**

List variables loading highly in the positive direction on PC1 ( $\geq +0.60$ )

List variables loading highly in the negative direction on PC1 ( $\leq -0.60$  – absolute value  $\geq 0.60$  but negative)

List variables with loadings  $\sim \leq |0.35|$  on PC1 (closer to zero than an absolute value of 0.35)

What do the chemicals loading highly on PC1 in the positive direction have in common? felsic? mafic?

What do the chemicals loading highly on PC1 in the negative direction have in common? felsic? mafic?

List anything loading highly in the positive direction on PC2 ( $\geq +0.60$ )

List variables loading highly in the negative direction on PC2 (more extreme than -0.60)

Of those variables loading highly in the negative direction on PC2, what do two of them have in common?

What is up with the other high negative loader on PC2? How does **that** concentrate on a planet's surface?

What loads pathetically on PC2 (e.g., loadings  $\sim \leq |0.35|$ )? (closer to 0 than absolute 0.35)?

Crazy high loading ( $\geq \pm |0.90|$ ) in the positive direction on PC3 and in the negative direction on PC3

Where (on Earth) do you tend to find the high loaders on PC3?

What is the polarity that PC3 is picking up on? (there are different ways to express it)

### The Geography of Geology (Areography of Areology?)

Coarse scale zonation

What kind of surface rock material is Spirit crossing over in segment one?

What kind of terrain/surface rock material is Spirit traversing in segment two?

What about segment three?

Finer scale features (look for names on the map near these sols)

sols 52 to about 65

sols 85 to 115

sols 112 to 122

after sols 150 to 158, Spirit is crossing the West Spur of which feature?

## The Areological History of Gusev Crater

Interpret the areological history of Gusev Crater based on Spirit's findings from sol 14 to sol 470. You are trying to create a narrative of the physical events and processes that happened in this landscape, **NOT** a history of **Spirit's** adventures. Apply the principles of spatial sequencing of the materials Spirit found and of temporal superposition of those materials to figure out what must have happened first, and then the various processes that must have been laid down in order afterwards. You should be able to come up with at least four stages in the evolution of this landscape.