Sedimentary and possible volcanic materials in Xanthe Terra

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Regional context

Previous work

- Old activity (3.8 to 4 Ga)
- Geologically short-term activity
- Hauber et al., PSS (2009)
Examples of fans and deltas (I)
Example (I)

"stepped" delta
cf Kraal et al. (2008)

5 km

CTX B21_017951_1955
Example (III)
from Hauber et al. (2009)
Example (II)

CTX P20_008813_1911
~6 km

~16 cm
Proposed landing site

Crater at terminus of Sabrina Vallis

HiRISE
CRISM

-2620 m
Slopes

Derived over ~150 m baselength from HRSC DEM
Eroded margins

HiRISE
(Sub)horizontal layering
Opal in a nearby fan delta
Opal in a nearby fan delta

Enhanced IR color
R = 2.5 µm
G = 1.5 µm
B = 1.1 µm

Spectral parameter map
R = 2.3-µm band depth 
(D2300; 0.001/0.006)
G = 2.2-µm band depth 
(BD2200; 0.001/0.003)
B = 1.9-µm band depth 
(BD1900R; 0.005/0.010)

Opal-rich light-toned material on the distal part of the fan delta

Probably authigenic material (Carter et al., LPSC, 2012)
Comparison to Eberswalde delta

Eberswalde delta is Hesperian-aged (Mangold et al., Icarus, in review)
Absolute model ages

Basis for crater counts: CTX images

A - Delta surface

B - Crater floor

34.2 ±3.2 Ma

1.70 ±0.47 Ga

1.35 ±0.37 Ga
Volcanism in a nearby filled crater (?)
dike?
Proposed traverse
Summary

Morphology
- variable sedimentary morphology: fans, (stepped) deltas
- deposits in Xanthe Terra indicative of short term activity

Mineralogy
- only one stepped delta with opaline silica
- interpretation: in situ formation

Chronology
- Much younger than Late Noachian/Early Hesperian!
  Trigger? Impacts (e.g., Eberswalde)
  Climate excursions (obliquity and orbital parameters)
  Volcanism
Pros and cons

**Pros**
- Sedimentary deposits
- Volcanic material (E2E iSAG)
- Safe landing

**Cons**
- No mineral detections
- Young age