Crevassing and capture by floodplain drains as a cause of partial avulsion and anastomosis (lower Rio Pastaza, Peru)

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Andean Foothill:

Alternating incision areas:
- Rio Napo/ Iquitos Arch
- Fitzcarrald Arch

And fluvial aggradation areas:
- Rio Pastaza-Marañon-Ucayali
- Rio Beni Lowlands

Dynamics of these Fluvial aggradation Areas?

1 – Rio Pastaza
2 – Rio Marañon
3 – Rio Ucayali
4 – Rio Beni

Amazon Basin
River network derived from SRTM elevation data at 500 m resolution

Kilometers

0 500 1000

N
Fluvial styles along the Rio Pastaza

The lower reach of the Rio Pastaza exhibits an anastomosing morphology.
Origin of anastomosis?

Anastomosing morphologies result of successive avulsions along a main channel giving birth to Anabranched channels (Smith et al., 1989; Makaske, 2001; Slingerland and Smith, 2004)

Avulsion can be complete (this case) or partial (two active channels)
Topography of the Area

Source: SRTM V3 DEM
Spectral response of the Northern Crevasse-splay
In 1991 and 2002

Satellite images (VNIR Band - Landsat 5 and 7)
Evolution through time of the northern crevasse-splay

Source: Landsat, Aster, CBERS
Morphology of the Northern Crevasse-splay
Morphology of the southern crevasse-splay
Origin of anastomosis: crevassing and progradational avulsions

- Onset of a crevasse splay.
- Development of a distributary drainage.

- Crevasse splay stream capture by a former floodplain stream.
- Abandonment of the distributary drainage on the crevasse splay.
- Onset of a new alluvial ridge on the anabranching channel.

AR: Alluvial Ridges (Channel + Levees)
CS: Crevasse Splay
DN: Distributary drainage network
FD: Floodplain drainage network
Consequences: Ancient avulsions of the Rio Pastaza and origin of the Pastaza Megafan
Migrations of the Rio Pastaza since the LGM (~21 000 Ka)

Green: Modern streams
Blue: re-annexed abandoned streams
Black: abandoned streams
Red: supposed abandoned streams
Orange: Tectonic structures of the subandean zone
Grey: Villano surface (around the LGM)

Bernal et al., 2011
Muchas Gracias

Related references:
