SIMILARITIES AND DIFFERENCES BETWEEN MEANDERING AND ANABRANCHING RIVERS

Jesús Marín Díaz [(1)], Gabriela Flores [(1)] & Jorge D. Abad [(1)]

(1) Universidad de Ingeniería y Tecnología (UTEC), Lima, Perú.

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E-mail: jmarin@utec.edu.pe

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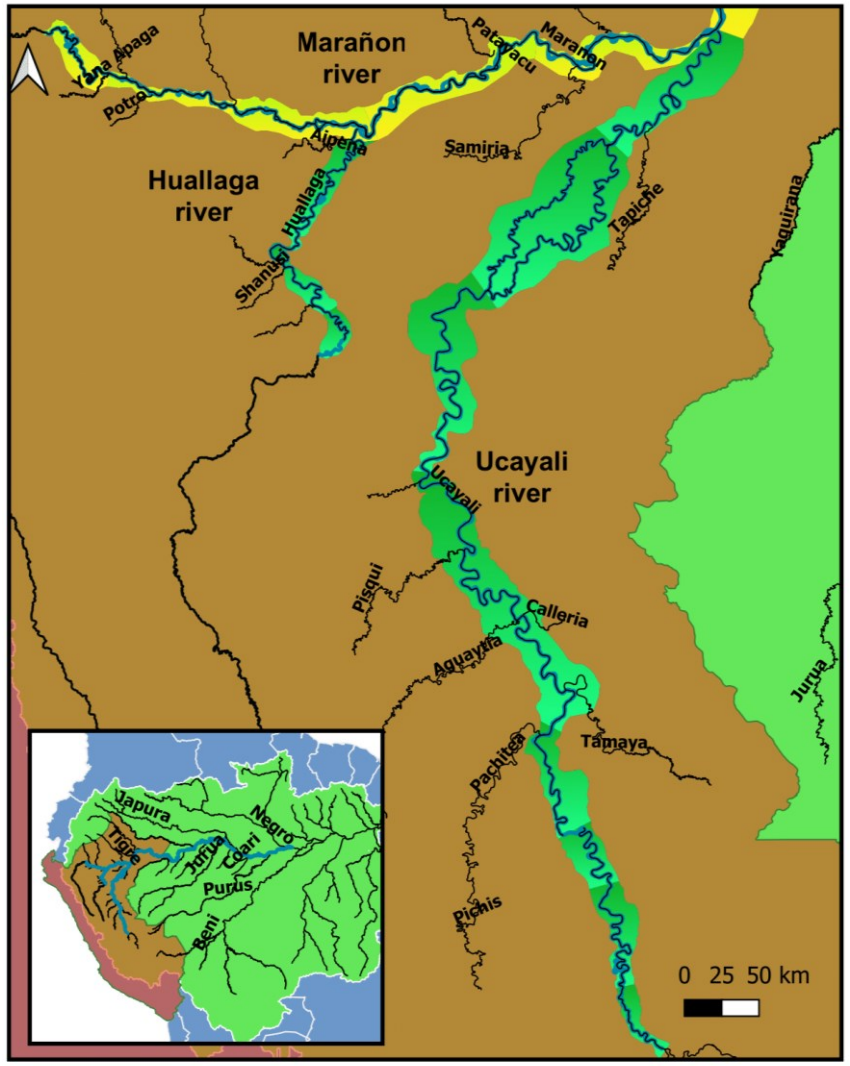
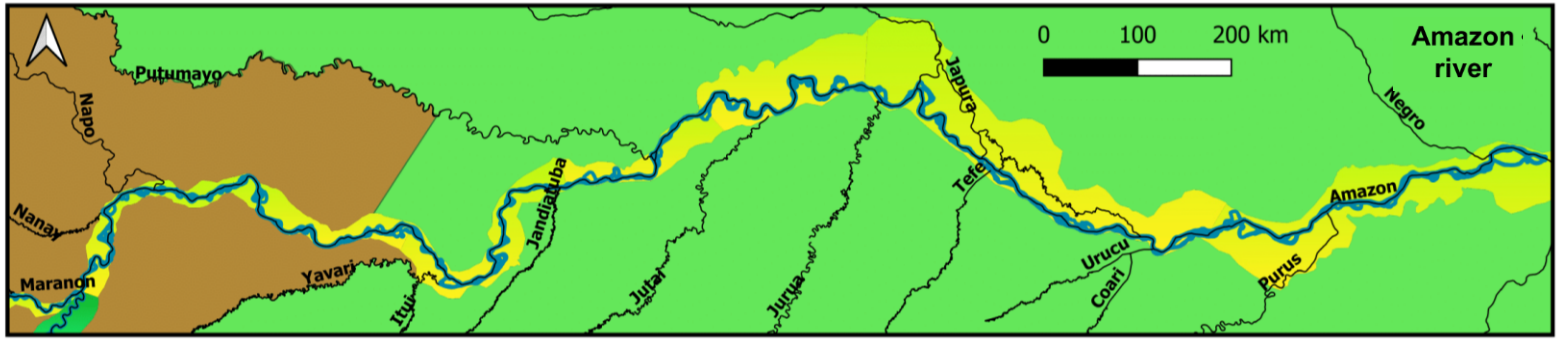
CONTEXT





Four rivers of the Amazon basin:

- Lower Huallaga river (from “Pongo de Aguirre” to confluence with Marañon river).
- Lower Marañon river (from “Pongo de Manseriche to confluence with Amazon river)
- Ucayali river (from the confluence of Urubamba and Tambo rivers, to the confluence with Amazon river).
- Amazon river (from the confluence of Ucayali and Marañon rivers, to past the confluence with the Negro river).

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HIGHLIGHTS

Multitemporal analysis

From: 1987 - 1989
To: 2017
Span: 4 (Meandering) and 6 (Anabranching) years

Valley

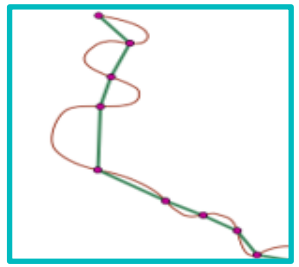
Using DEM (30m) to delineate the geological valley.

River images

Images: Using Landsat 5, 7 and 8.
Temporal scale: Dry season (June to August).
Metrics: Mstat, R and QGIS

Main channel centerline

For Anabranching: Selection of the wider channel.



Inflection points

Half (two consecutive inflection points) and full meanders (two consecutive half meanders).

Sections

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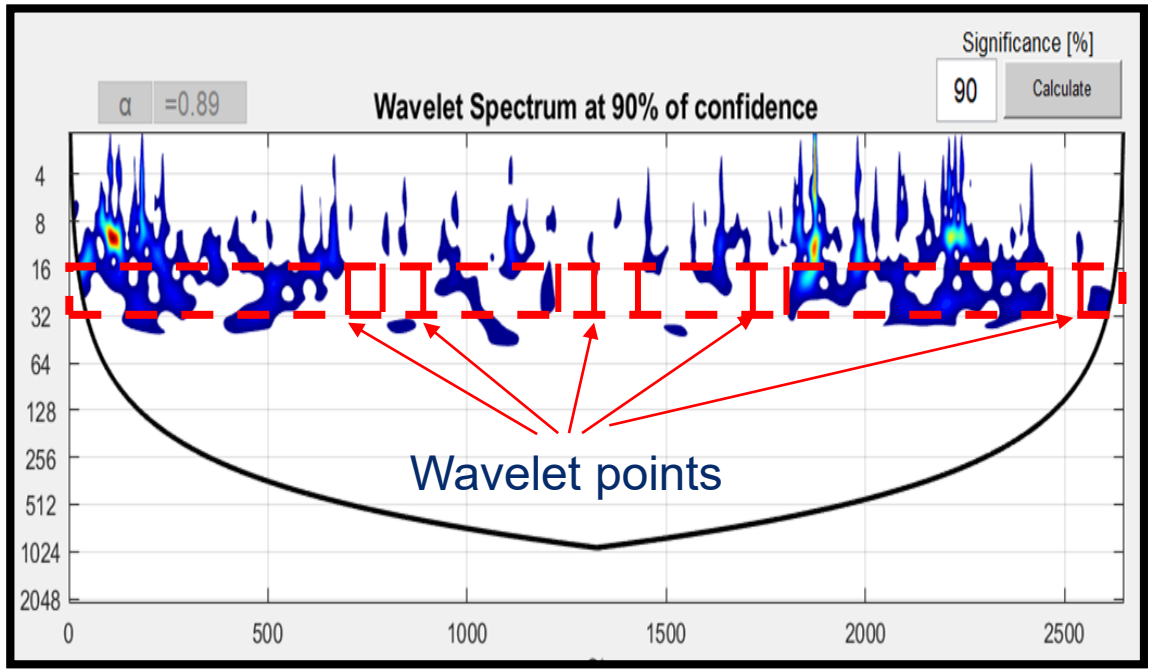
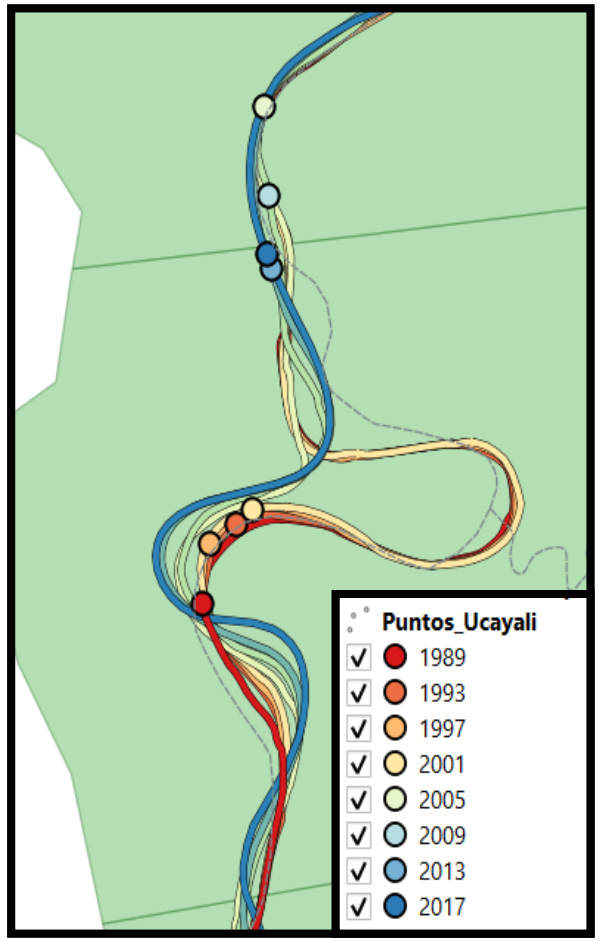
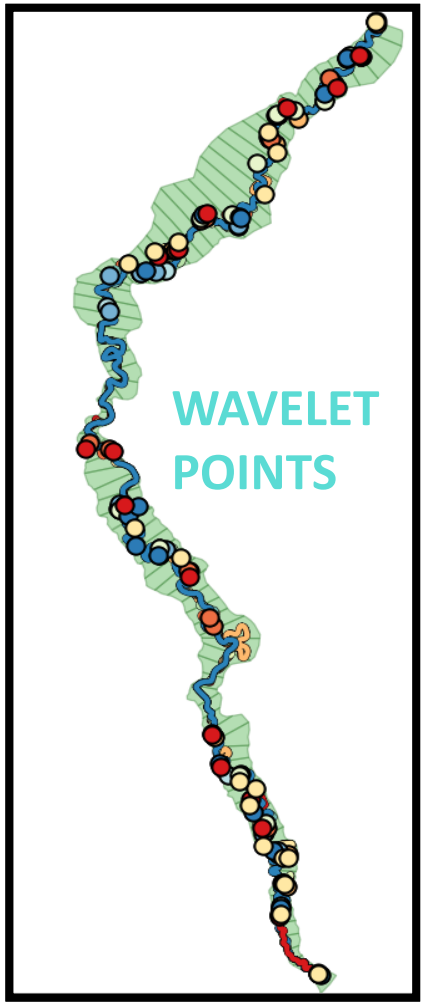
SECTIONS

- Size of the half meanders (using wavelets) for all years.

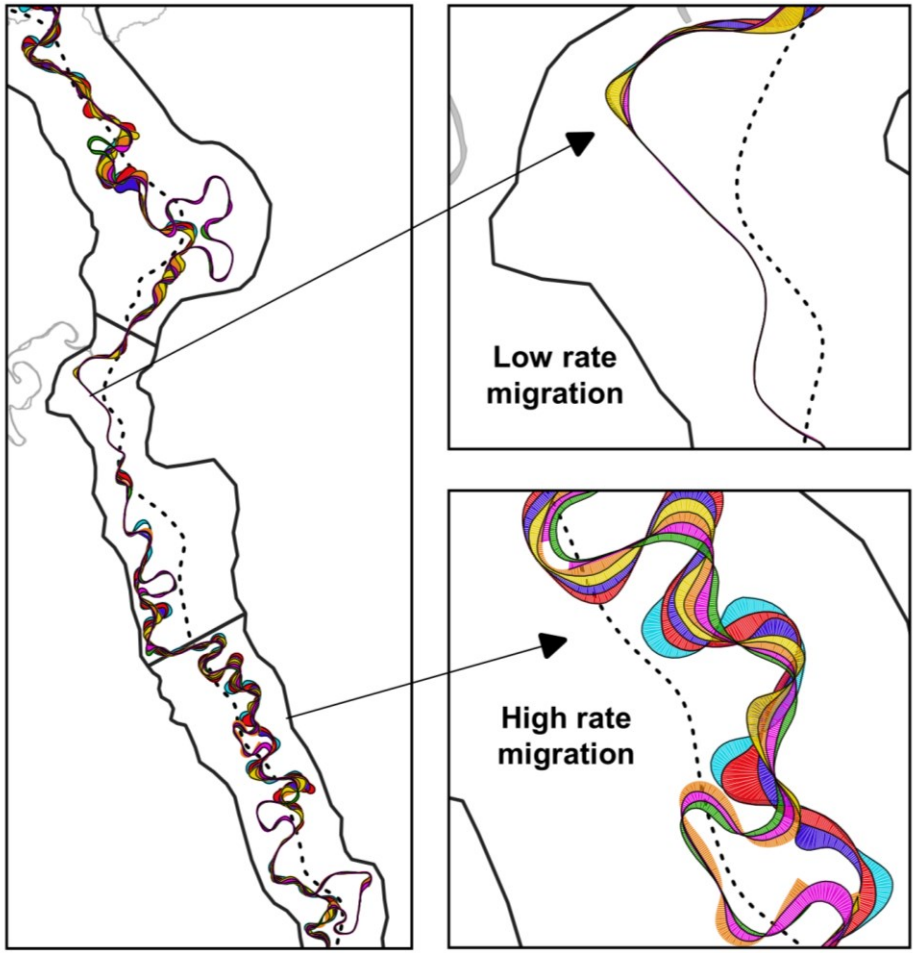


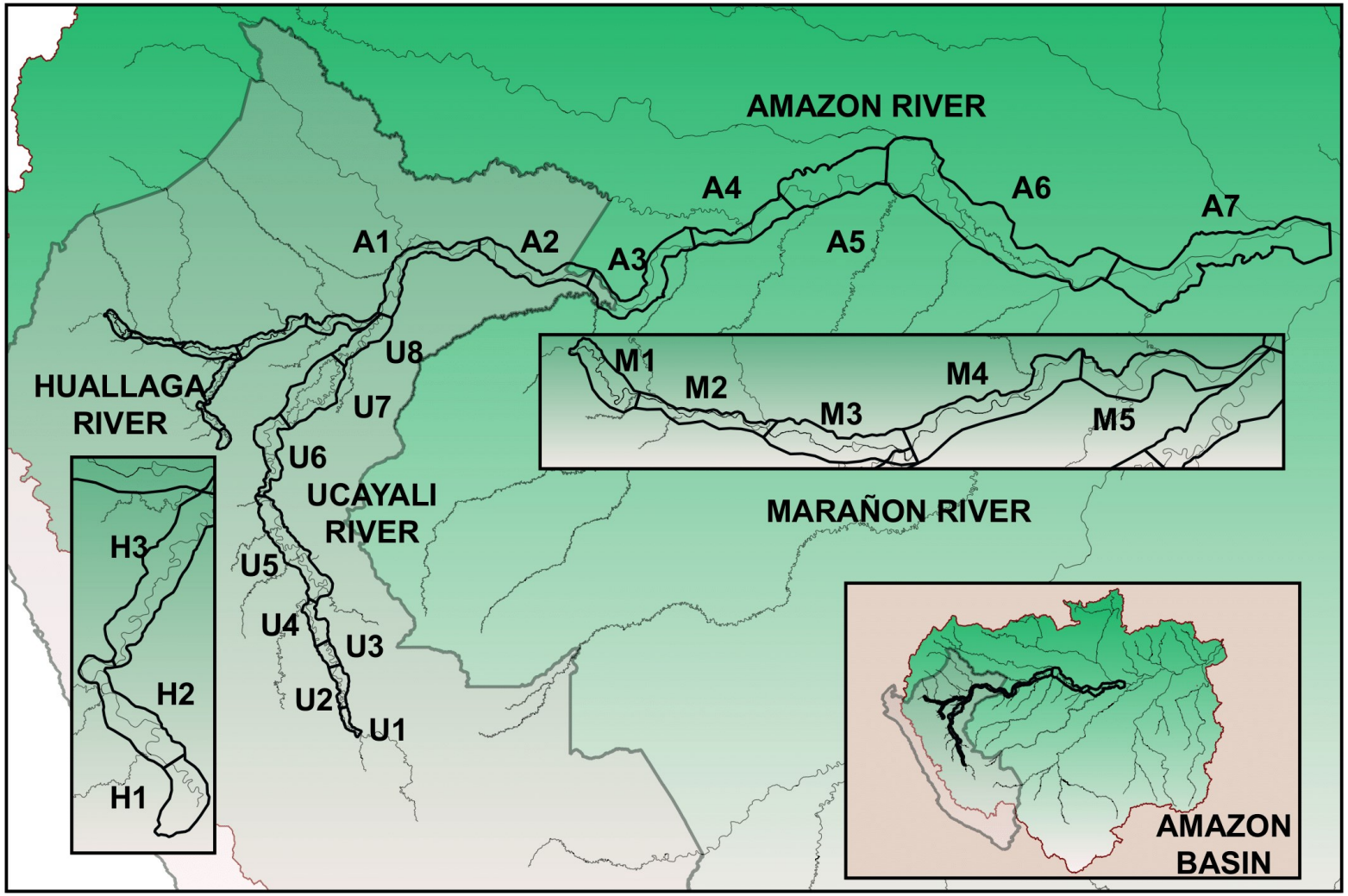




SECTIONS

- Multitemporal river behavior (migration rates).
- Valley restrictions (confinement or river redirection).
- Tributary rivers.





TOTAL SECTIONS

- Amazon: 7
- Huallaga: 3
- Ucayali: 8
- Marañon: 5

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VARIABLES

Migration rates

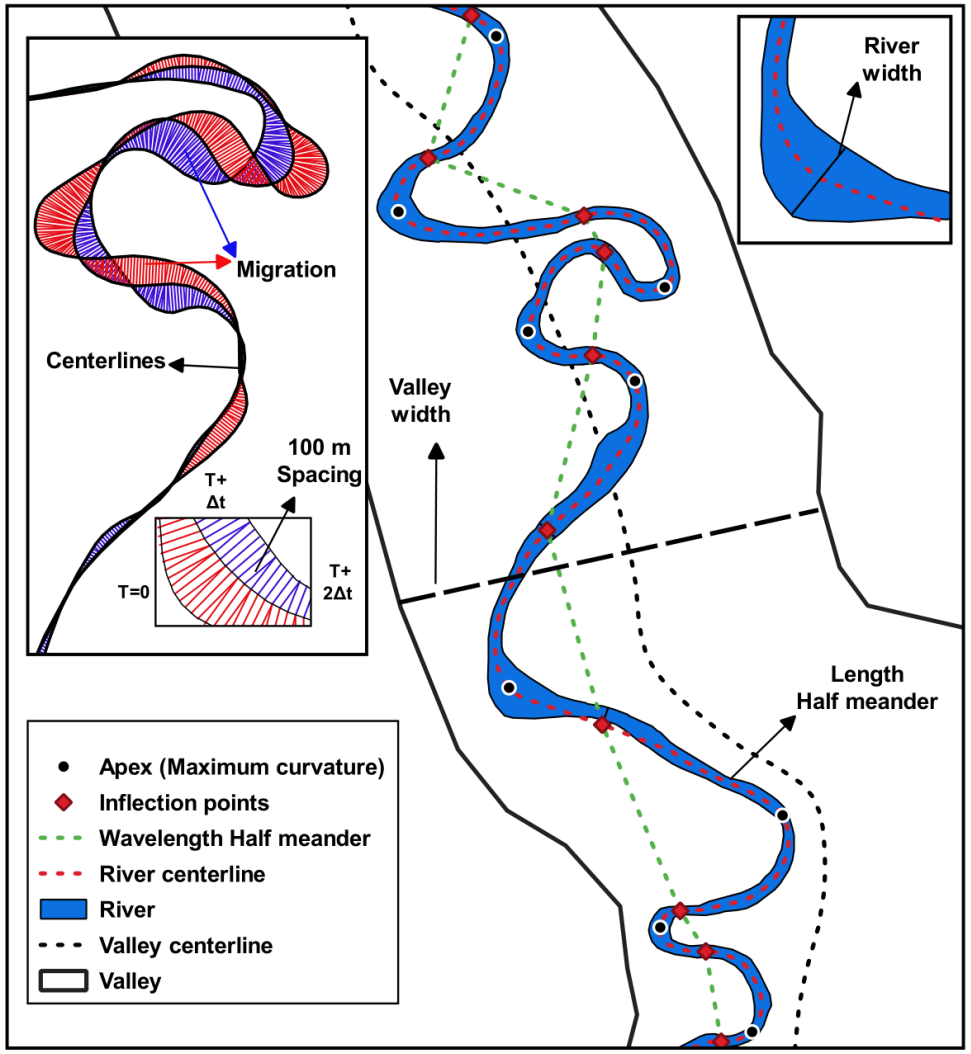
$\frac{Length}{Width}$

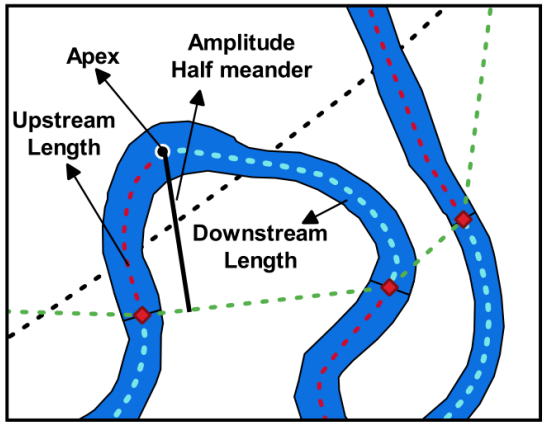
$\frac{Valley\ width}{Amplitude}$

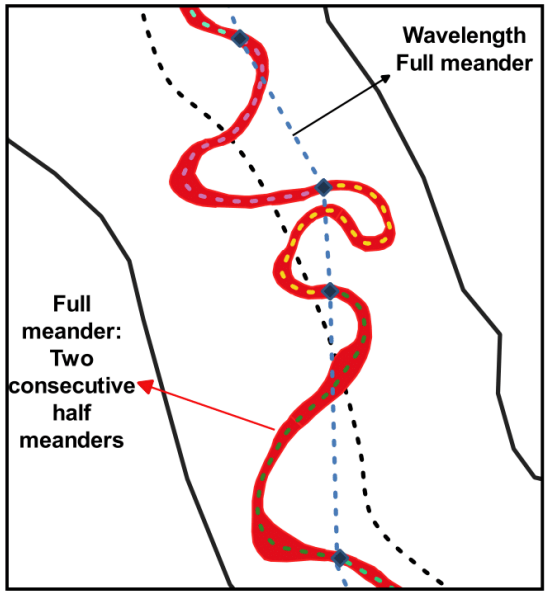
Confinement: $\frac{Valley\ width}{River\ width}$

Sinuosity: $\frac{Length}{Wavelength}$

Asymmetry: $\frac{Upstream\ -\ Downstream}{Length}$







- **Half meander**
  - Length/ Width
  - Valley/ Amplitude
  - Sinuosity
  - Confinement
  - Asymmetry
- **Full meander**
  - Length/ Width
  - Sinuosity
- **Full river**
  - Sinuosity
  - Migration (sum)
  - Migration rate (mean)

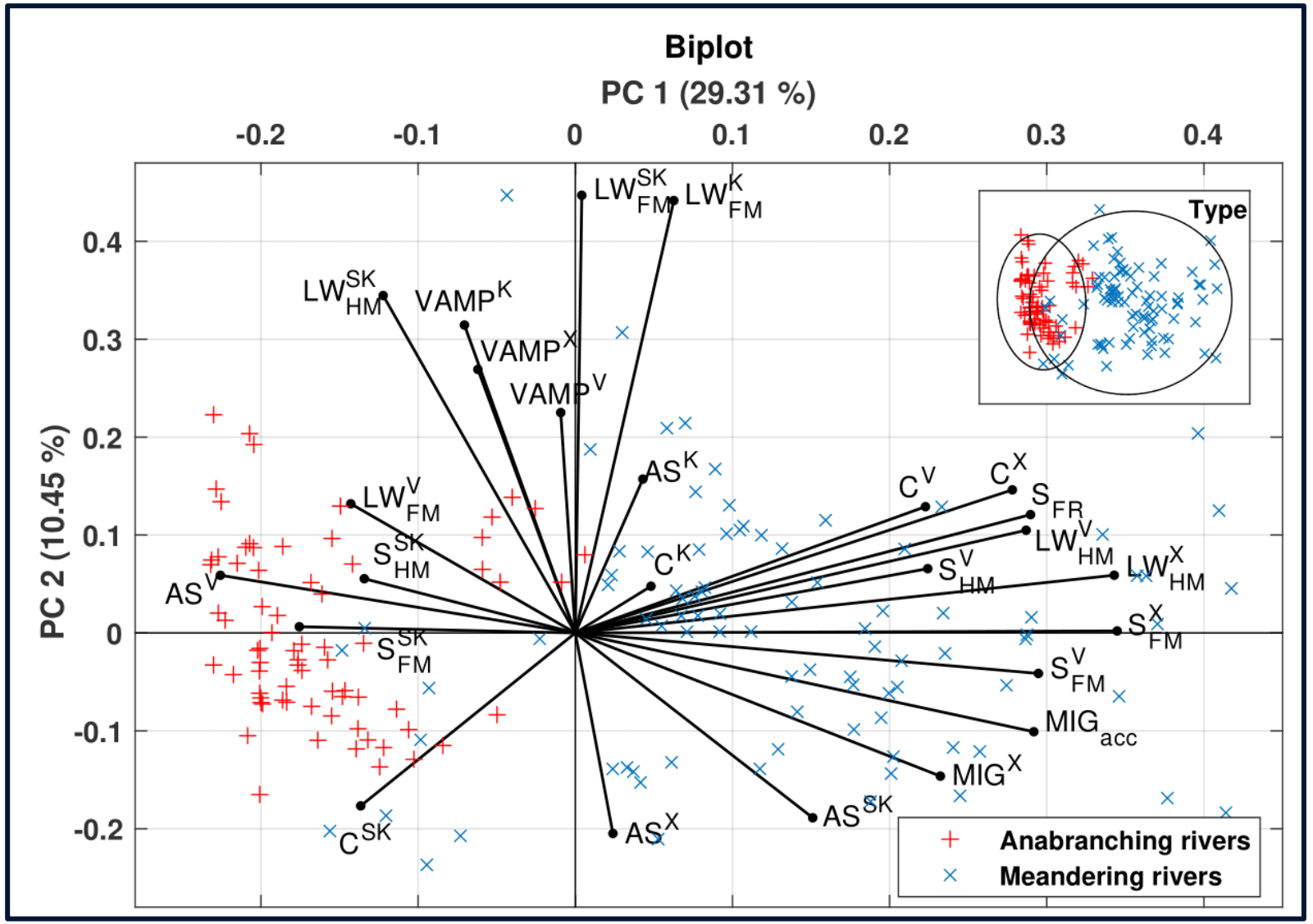
VARIABLE STATISTICS

- Mean
- Variance
- Kurtosis
- Skewness

PCA

Anabranching

- More variance in Asymmetry.
- Valley/Amplitude variables more associated.



Meandering

- Lower mean confinement (elevated values).
- Higher Sinuosity.
- Elevated rate of Migration.

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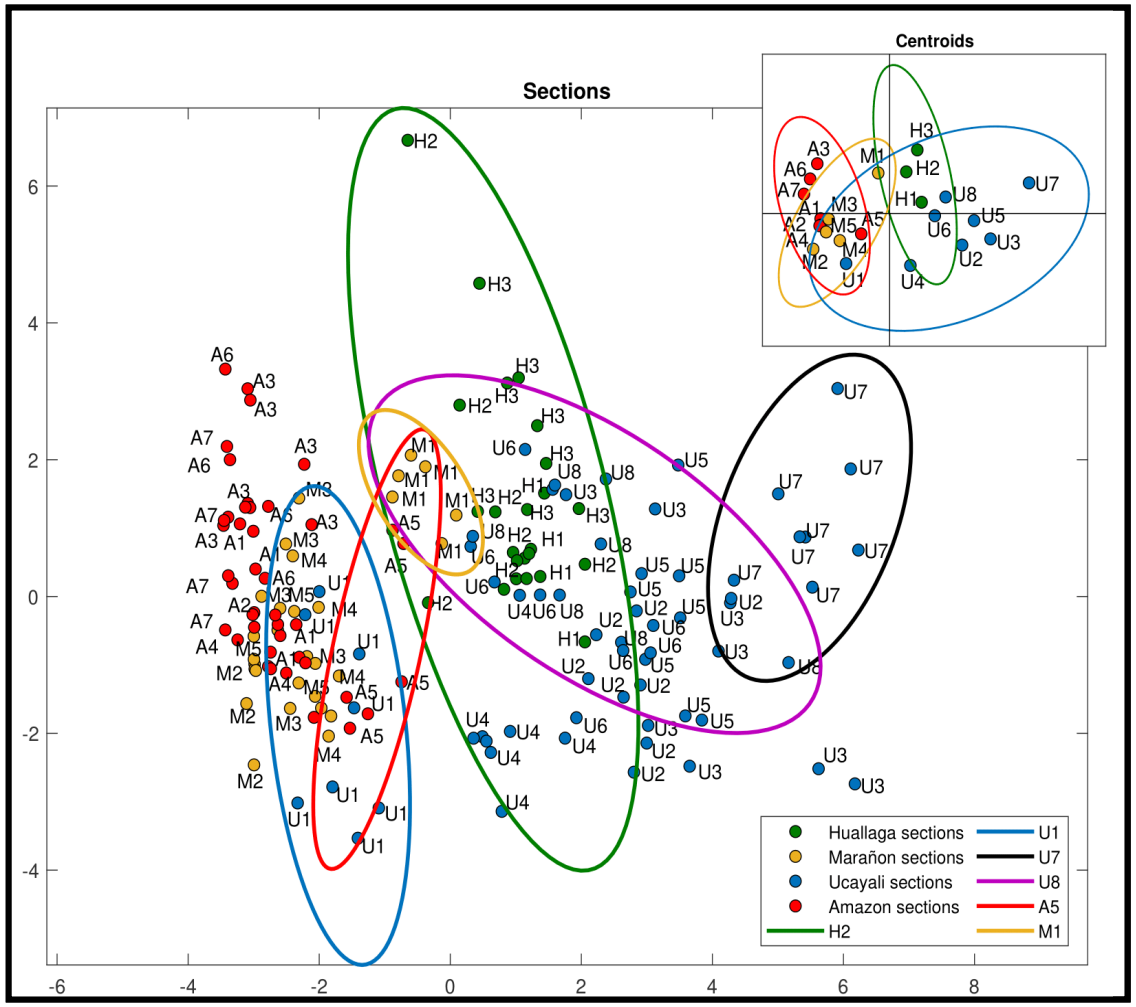

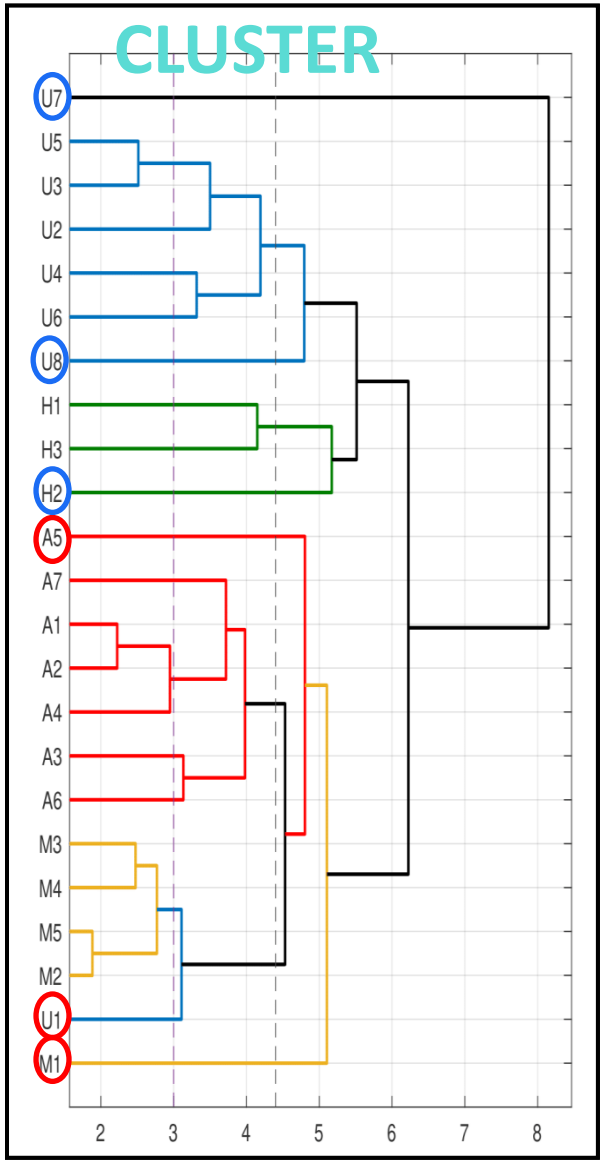

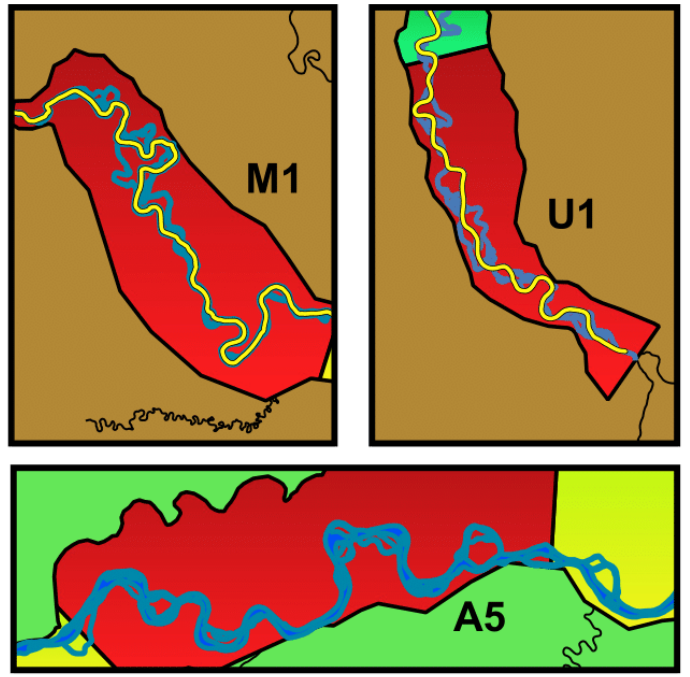

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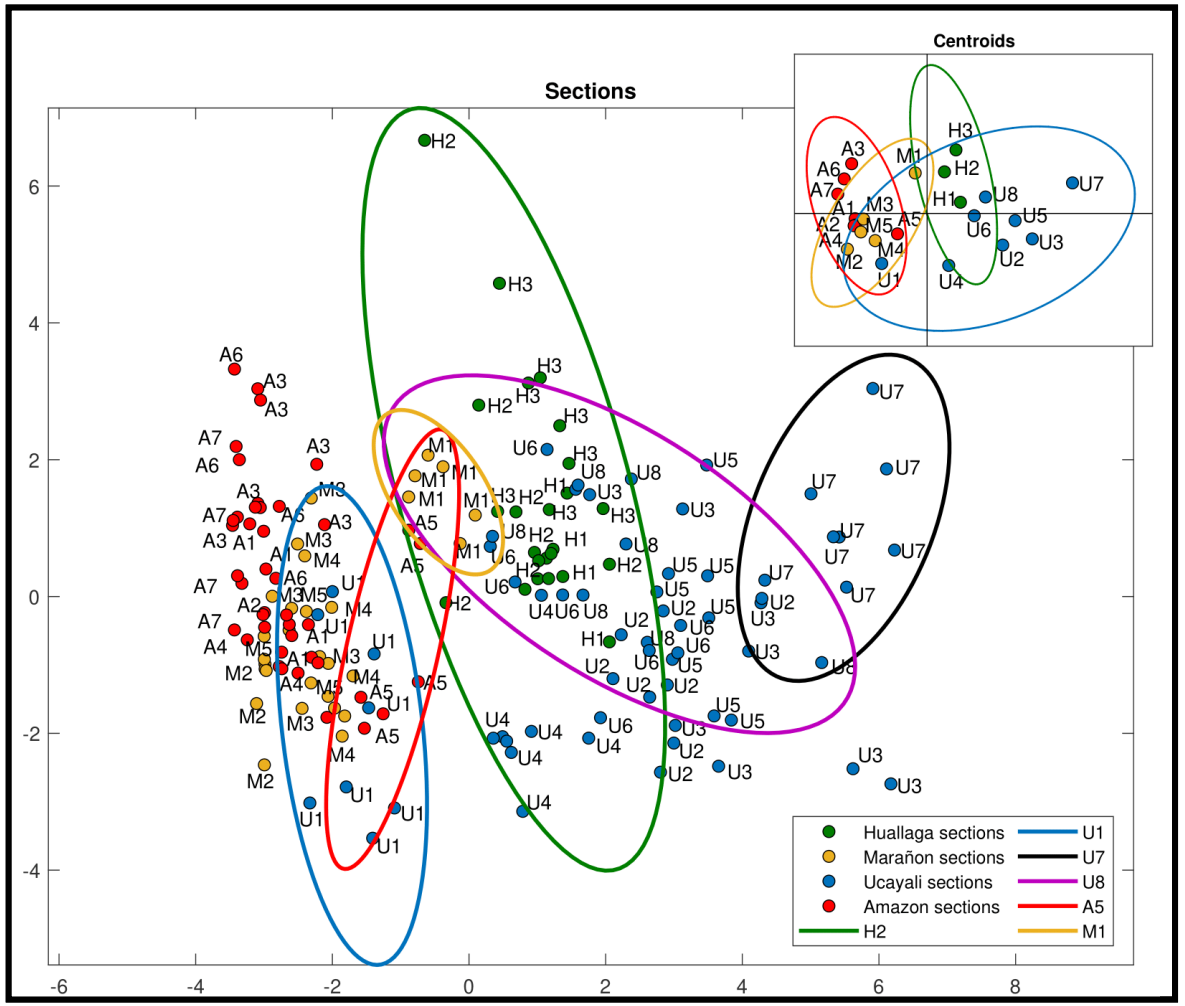

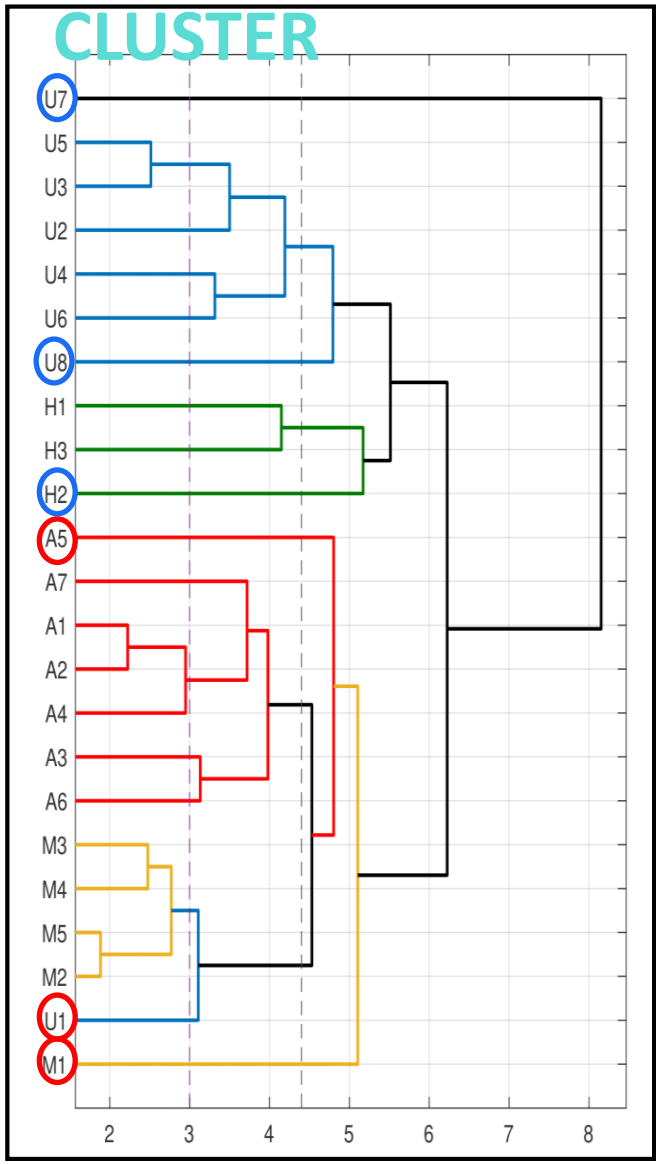

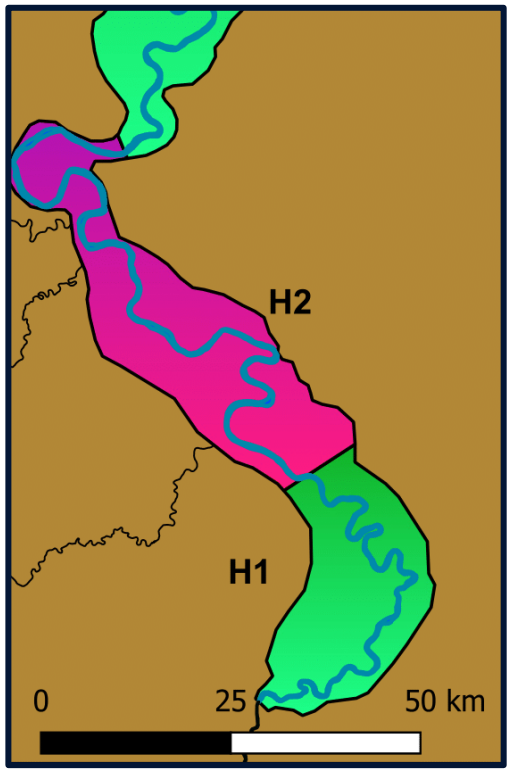

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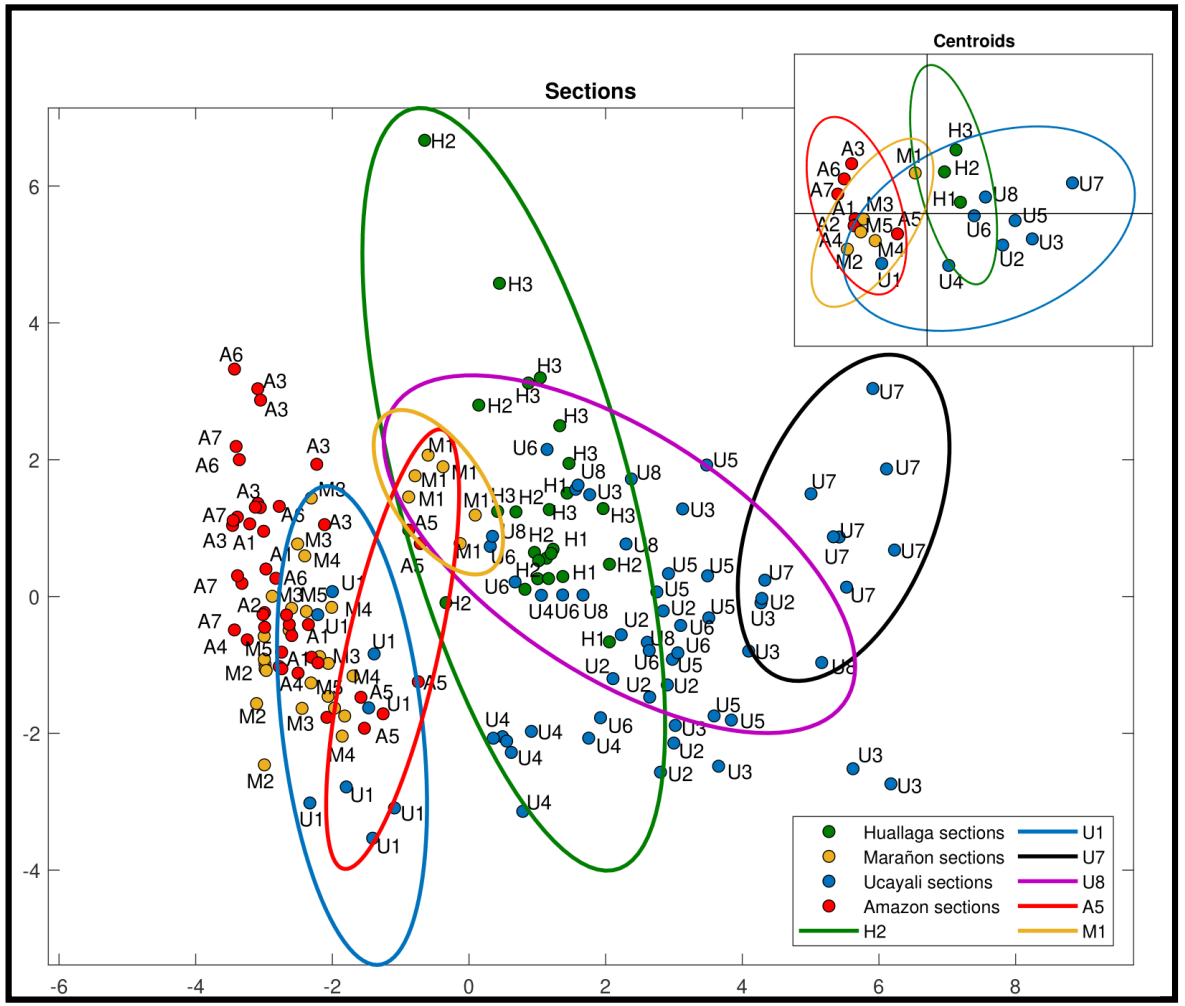

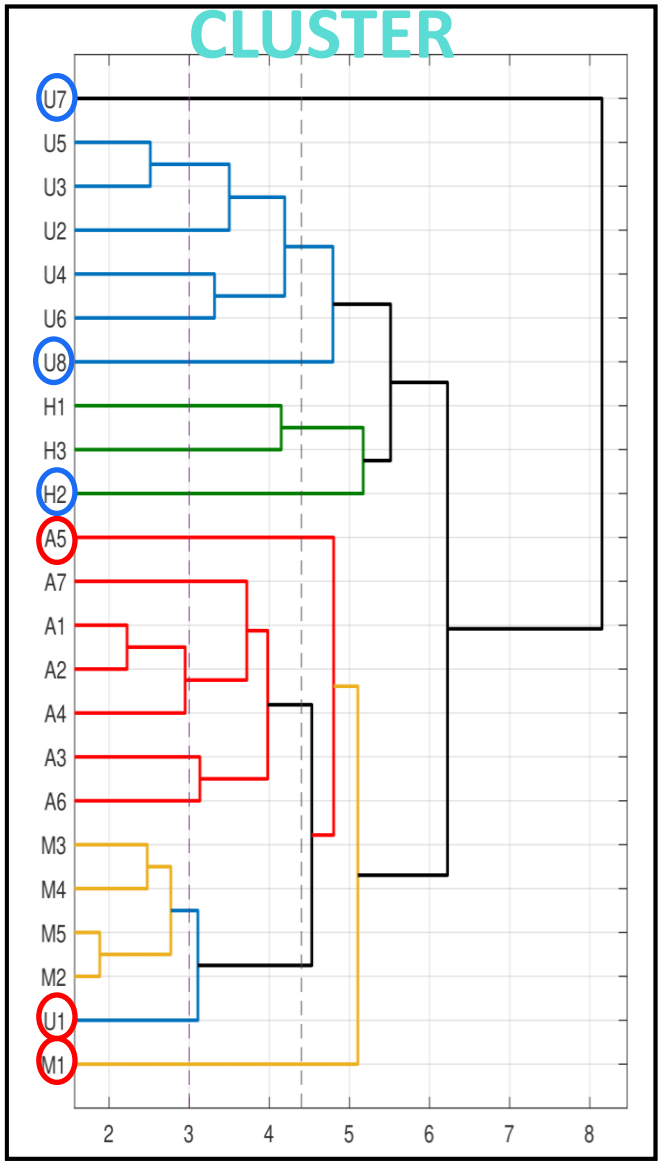

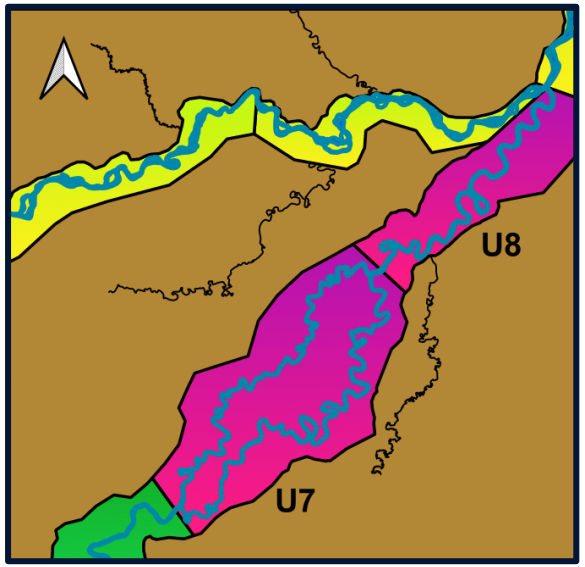

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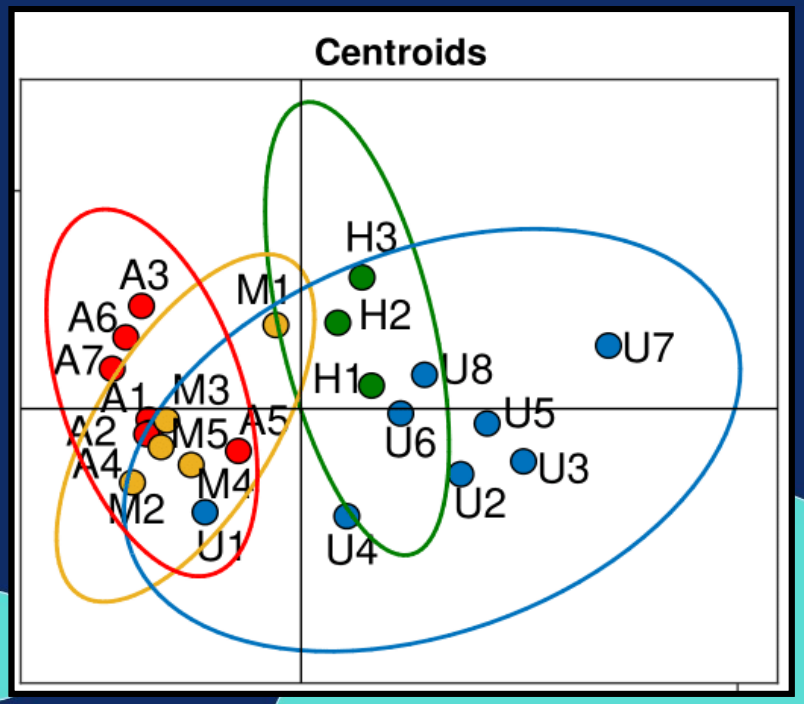
Summary

- Characterizing some sections as individuals allows us to understand some local processes that may define the structure of the river.
- The multitemporal approach denotes a great importance of analysis in systems that are subject to constant dynamics.
- The PCA highlighted the need for a complete set of statistics that can recognize different features of these rivers, capturing greater complexity.



Contact me:

jmarin@utec.edu.pe

THANK YOU!

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