

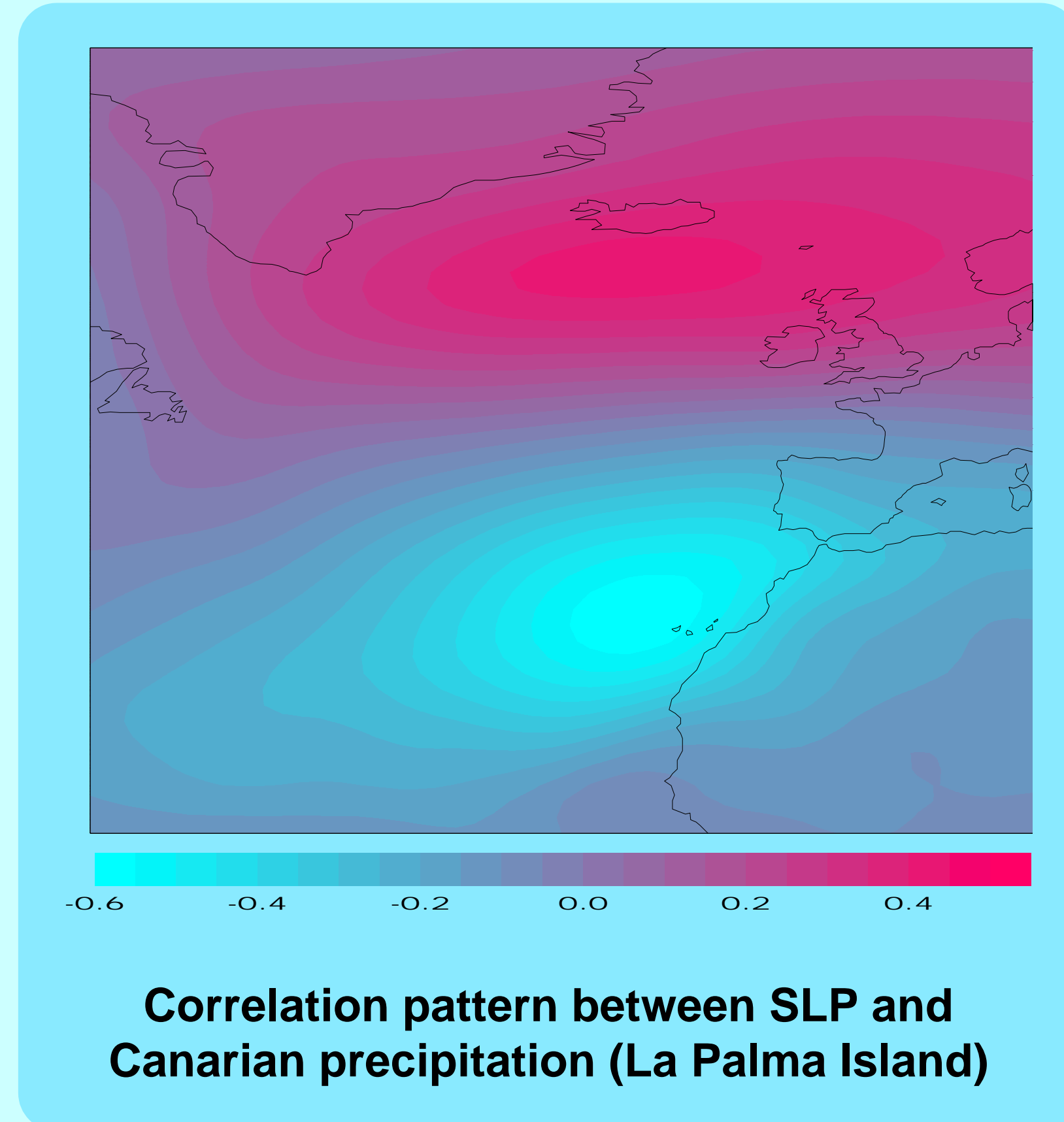
# A NAO Proxy from Documentary Records of the Canary Islands

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## NAO Influence Over the Canarian Rainfall

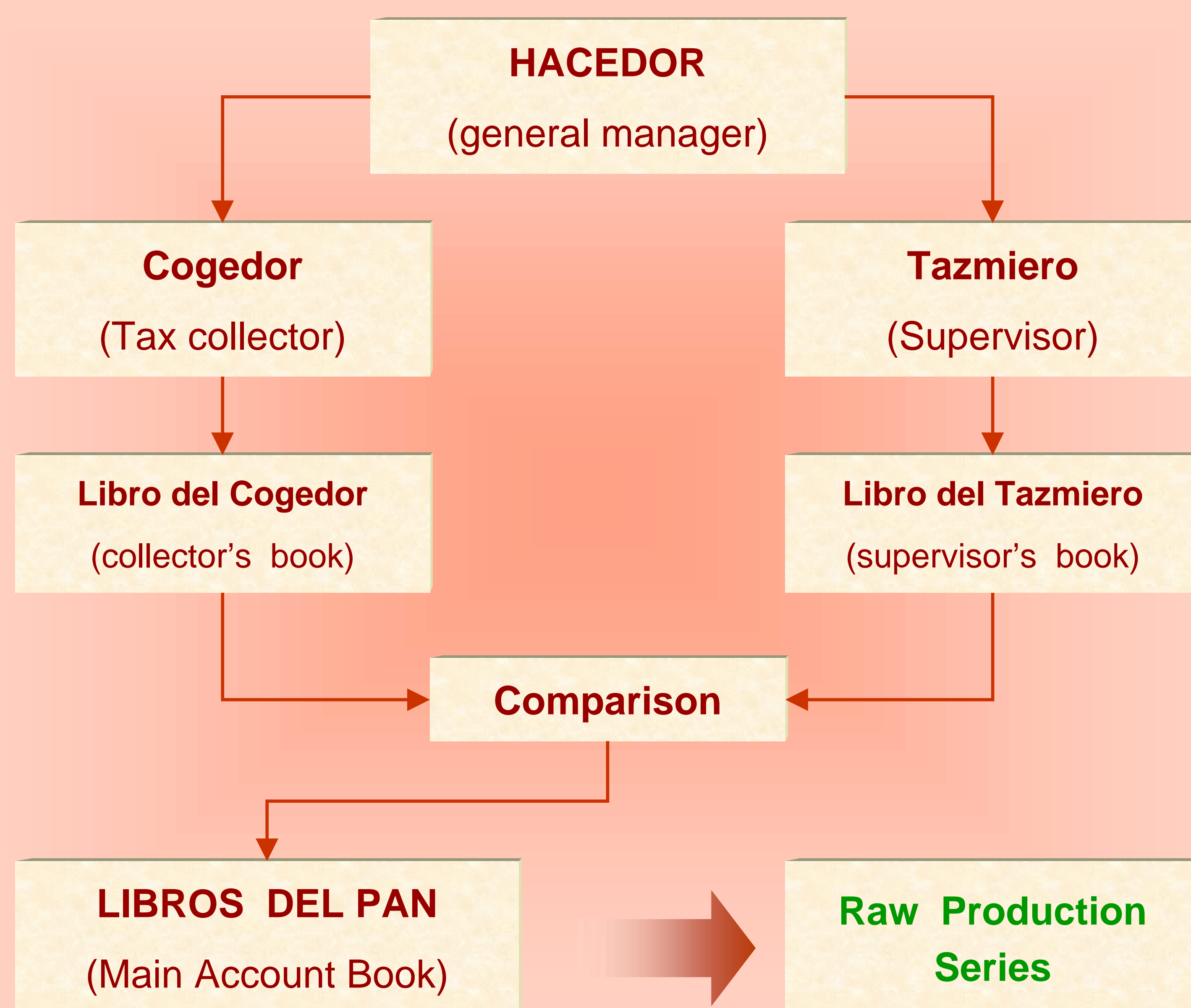
- The Canary Islands constitute an excellent natural observatory of atmospheric disturbances in the Subtropical North Atlantic.
- Their location, close to the southern edge of the Azores High, along with their complex orography, make the **Canarian rainfall very sensitive to changes in the subtropical circulation associated to the NAO.**
- NAO index exhibits a significant **negative correlation** with the precipitation in the Islands, which is greater for the five western islands (-0.40 in average).



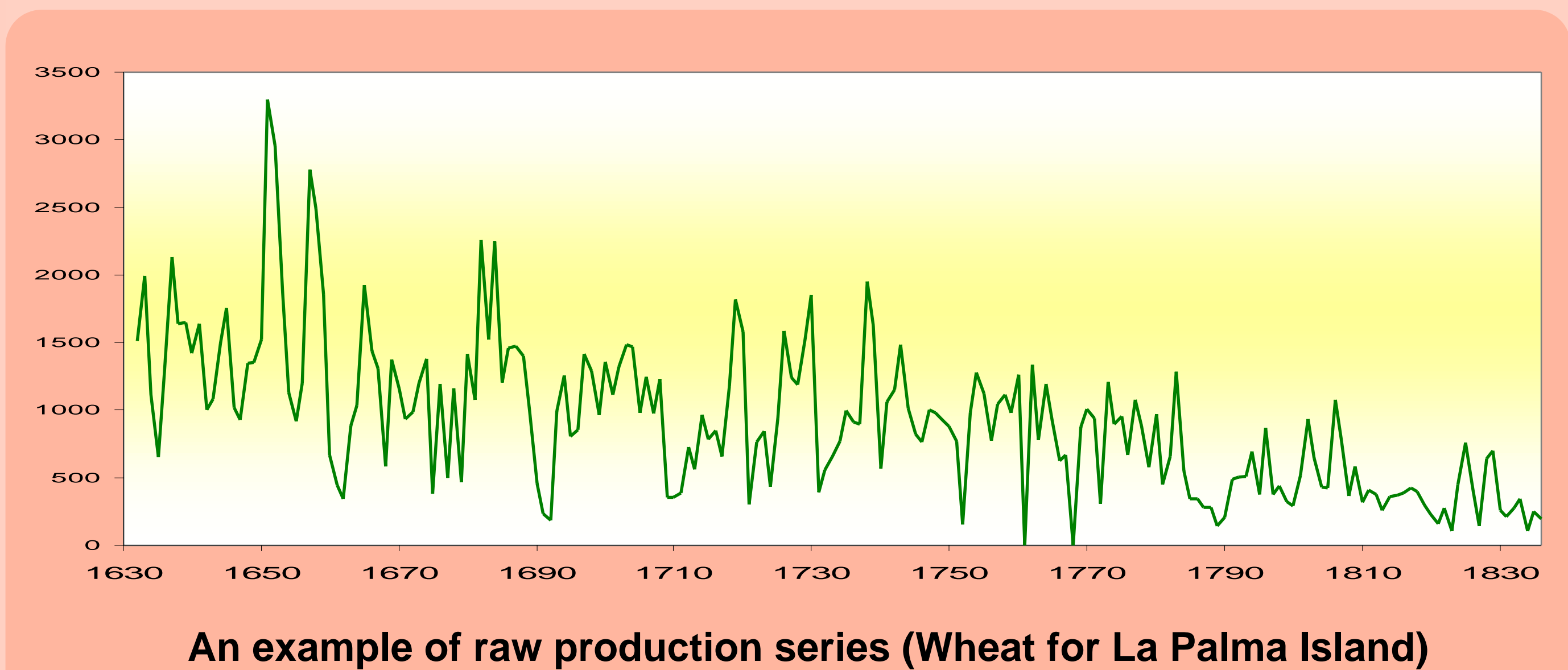
## The Tithes System

- It was a tributary system managed by the Church. The collected amount was distributed among the Church, the Aristocracy and the Crown.
- It was a **highly controlled, bureaucratic and documented procedure**, with several redundant controls to avoid fraud.
- There were two methods to pay the tithes: pay in kind (cereals) and pay in money after public auction (rest).
- Payment in kind (10% of total farmer's production), allows to estimate very accurately the total cereal production for each island, **which was strongly affected by the precipitation regime.**
- Since late XVI to mid XIX the system worked homogeneously.

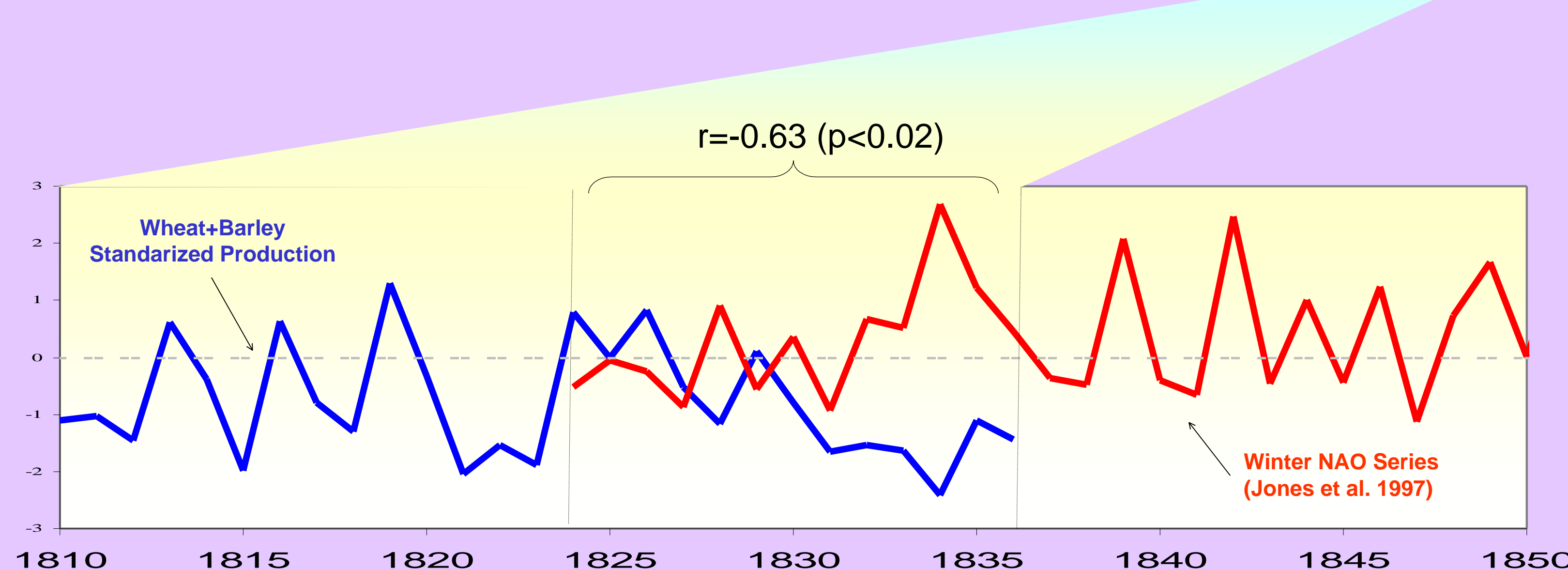
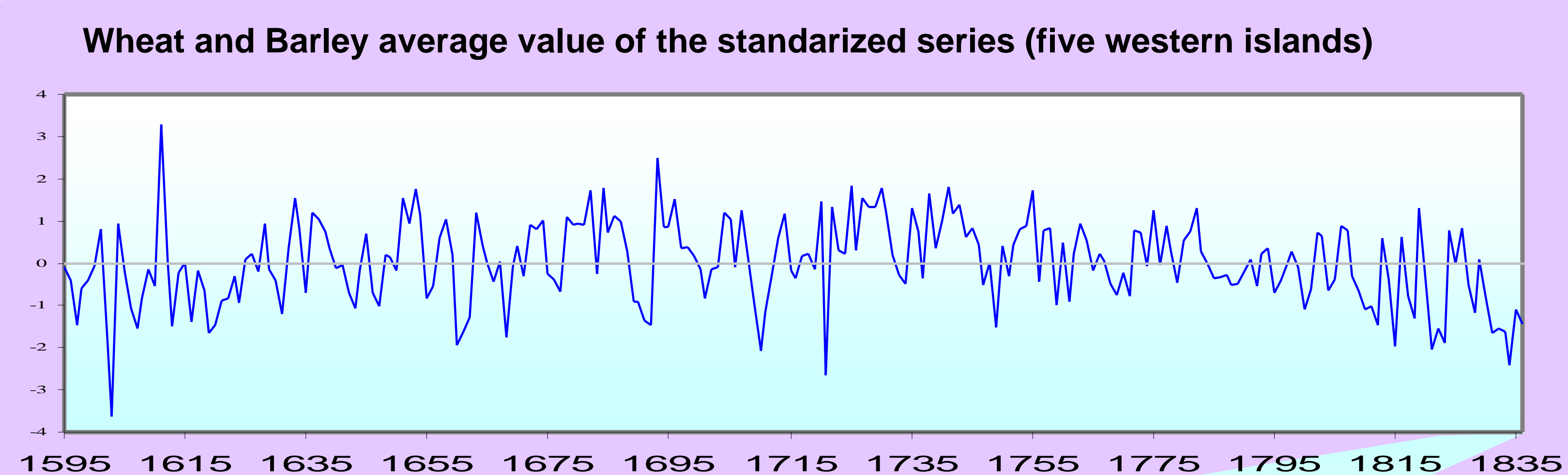
## Tithes Time Series Reconstruction



- The raw tithes series has been collected primarily from original documents preserved in the *Cabildo Catedralicio* (Las Palmas de Gran Canaria) and local private archives. The main source of data were the *Libros del Pan*, which summarized the information collected along the tax collection procedure.
- Extreme care has been taken to control for transcription error and subjectivity typical of the ancient documents.
- Crosschecking procedures have been implemented to elucidate discrepancies between different documents in the same archive and between different archives.



## Raw Series Filtering and Calibration



- Only crops paid in kind** (cereal) were chosen in order to work with real productions. Otherwise, the production must be inferred from the price obtained in public auction, which is largely variable by non-climatic factors.
- Non-significant or very variable cereal crops were avoided (ex. rye).
- Only production of the most powerful NAO signal islands (the five western ones) were chosen.
- Further work on factors other than precipitation has been made in order to filter minima non due to climatic origin, for example those due to locust plagues.
- The average value of the standardized series of total wheat and barley productions for the five western islands, **can be used as a NAO proxy index.** It shows a **strong significant correlation** with the early instrumental winter NAO series of Jones et al. over the 13-year common period.