



# NETBIOME-CSA

STRENGTHENING EUROPEAN RESEARCH COOPERATION FOR SMART  
AND SUSTAINABLE MANAGEMENT OF TROPICAL AND SUBTROPICAL BIODIVERSITY  
IN OUTERMOST REGIONS AND OVERSEAS COUNTRIES AND TERRITORIES

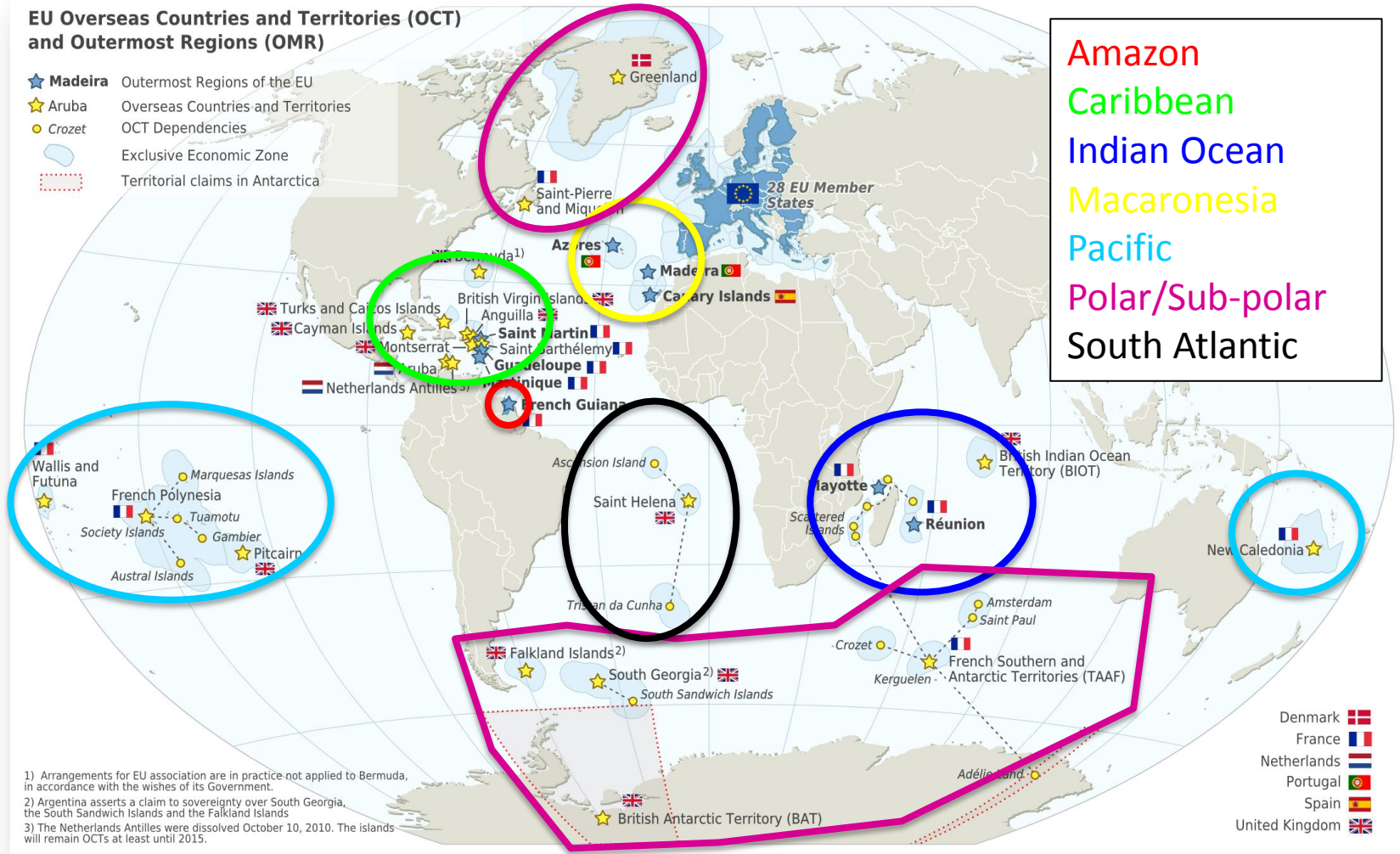
## *Terrestrial and marine bioclimatic characterization of the ORs & OCTs*

Niels Raes – Naturalis Biodiversity Center



## EU Overseas Countries and Territories (OCT) and Outermost Regions (OMR)

- ★ Madeira Outermost Regions of the EU
- ★ Aruba Overseas Countries and Territories
- Crozet OCT Dependencies
- Exclusive Economic Zone
- Territorial claims in Antarctica



Amazon  
Caribbean  
Indian Ocean  
Macaronesia  
Pacific  
Polar/Sub-polar  
South Atlantic

From: EU



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**NetBiome-CSA** aims to identify, and then to address, perceived priority challenges in conciliating a) **conservation and sustainable management of tropical biodiversity** with b) **the sustainable development of Europe's regions and territories**, based on c) **the benefits from high biodiversity**.



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**NetBiome-CSA** aims to identify, and then to address, perceived priority challenges in conciliating a) **conservation and sustainable management of tropical biodiversity** with b) **the sustainable development of Europe's regions and territories**, based on c) **the benefits from high biodiversity**.

*Biodiversity is for an important part driven by bioclimatic factors related to **temperature and precipitation in the terrestrial realm**, and by **sea surface- and surface air temperatures (sst & sat)**, **bathymetric depth and salinity in the marine realm** (besides accessibility and biotic interactions).*



# Aims

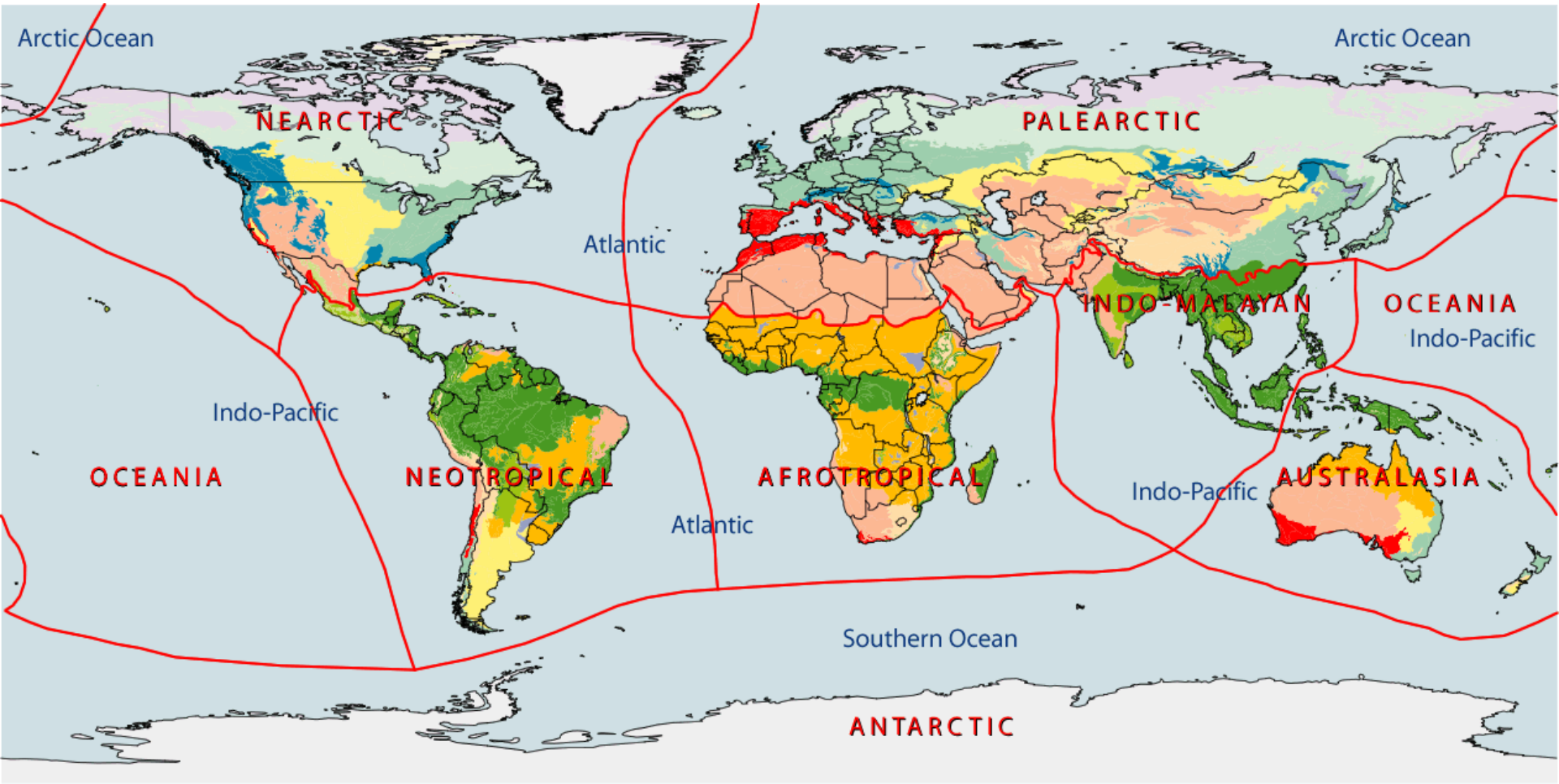
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Identify partnerships based on **terrestrial** and **marine** bioclimatic characterization of the OR & OCT.

1. What are the bioclimatic similarities between the **32 terrestrial regions**? (Greenland and BAT excluded).



# Terrestrial biogeographic realms of the World



From: WWF



# Aims

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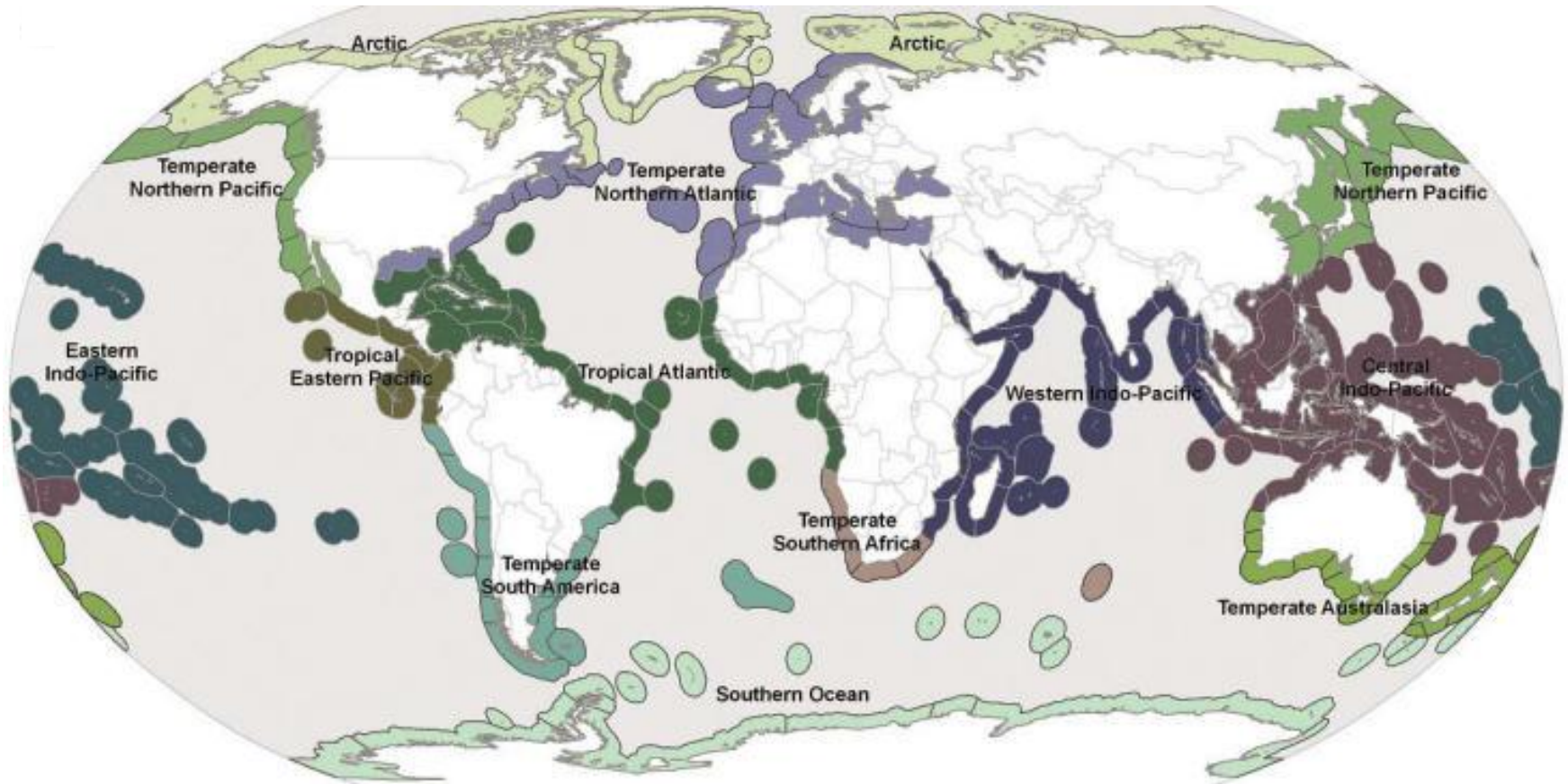
Identify partnerships based on **terrestrial** and **marine** bioclimatic characterization of the OR & OCT.

1. What are the bioclimatic similarities between the 32 terrestrial regions? (Greenland and BAT excluded).
2. What are the bioclimatic similarities between the **32 marine EEZ** (Exclusive Economic Zones) **regions**?





# Marine Ecoregions of the World



From: Spalding *et al.* 2007. *BioScience* 57: 573



# Methodology - terrestrial

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- Bioclimatic variables from WorldClim.org at 1km<sup>2</sup> for OR & OCT regions.



# Methodology - terrestrial

- BIO1 = Annual Mean Temperature
- BIO2 = Mean Diurnal Range (Mean of monthly (max temp - min temp))
- BIO3 = Isothermality (BIO2/BIO7) (\* 100)
- BIO4 = Temperature Seasonality (standard deviation \*100)
- BIO5 = Max Temperature of Warmest Month
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- BIO7 = Temperature Annual Range (BIO5-BIO6)
- BIO8 = Mean Temperature of Wettest Quarter
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- Alt = Altitude

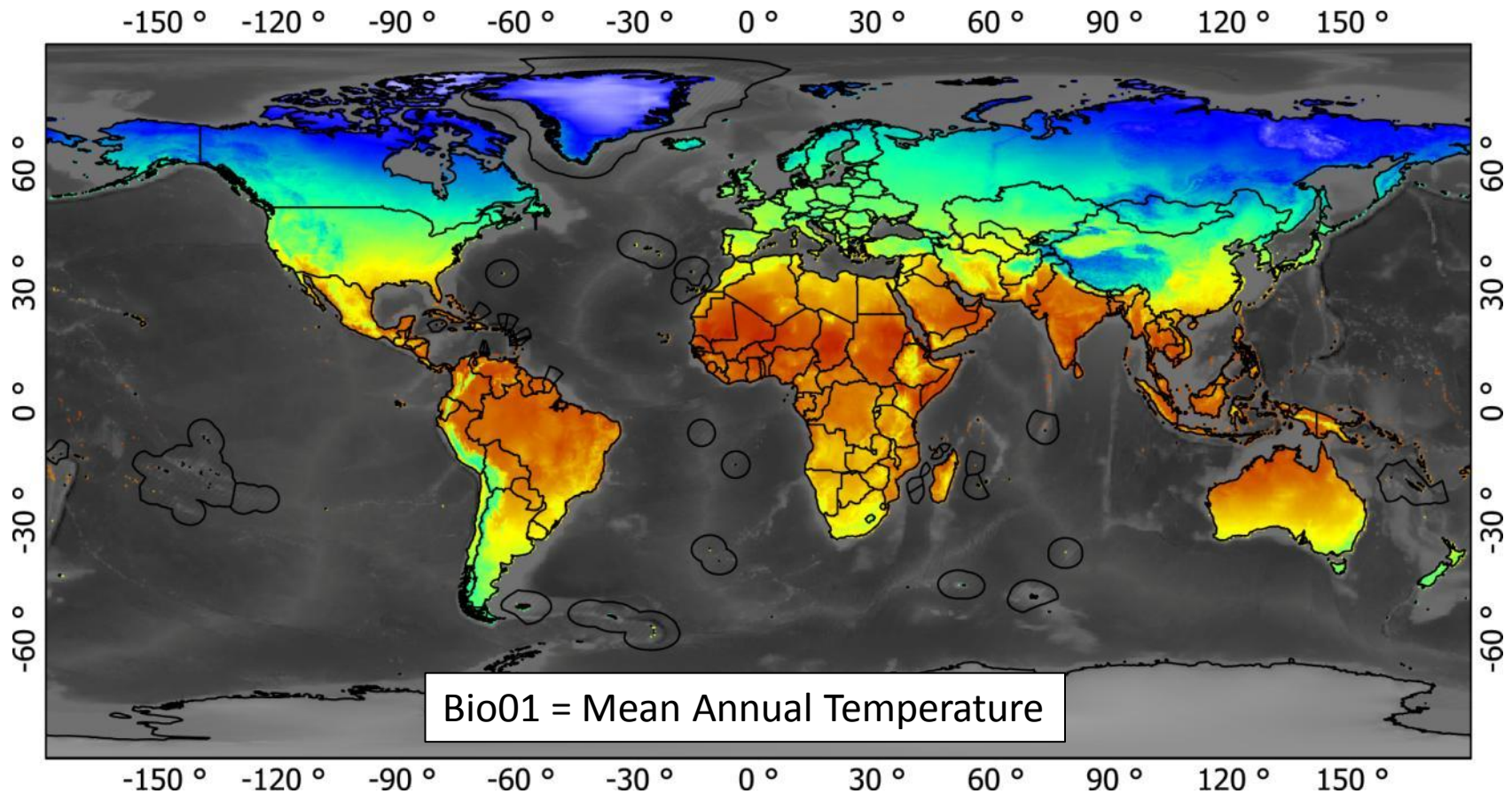
Temperature

Precipitation

Altitude



# Methodology - terrestrial



# Methodology - terrestrial

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- Bioclimatic variables from WorldClim.org at 1km<sup>2</sup> for OR & OCT regions.
- Summarize multi-variate environmental space in three axes using a Principal Component Analysis (PCA – standardized and centered).



# Methodology - terrestrial

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- Bioclimatic variables from WorldClim.org at 1km<sup>2</sup> for OR & OCT regions.
- Summarize multi-variate environmental space in three axes using a Principal Component Analysis (PCA – standardized and centered).
- Identify island groups with similar multivariate bioclimatic conditions.



# Methodology - marine

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- Similar to **terrestrial**, but making use of the Bio-ORACLE marine variables (<http://www.oracle.ugent.be/>) and etopo30 bathymetric data – all scaled to 5 arc-minutes spatial resolution ( $\sim 10 \times 10$  km).





# Methodology - marine

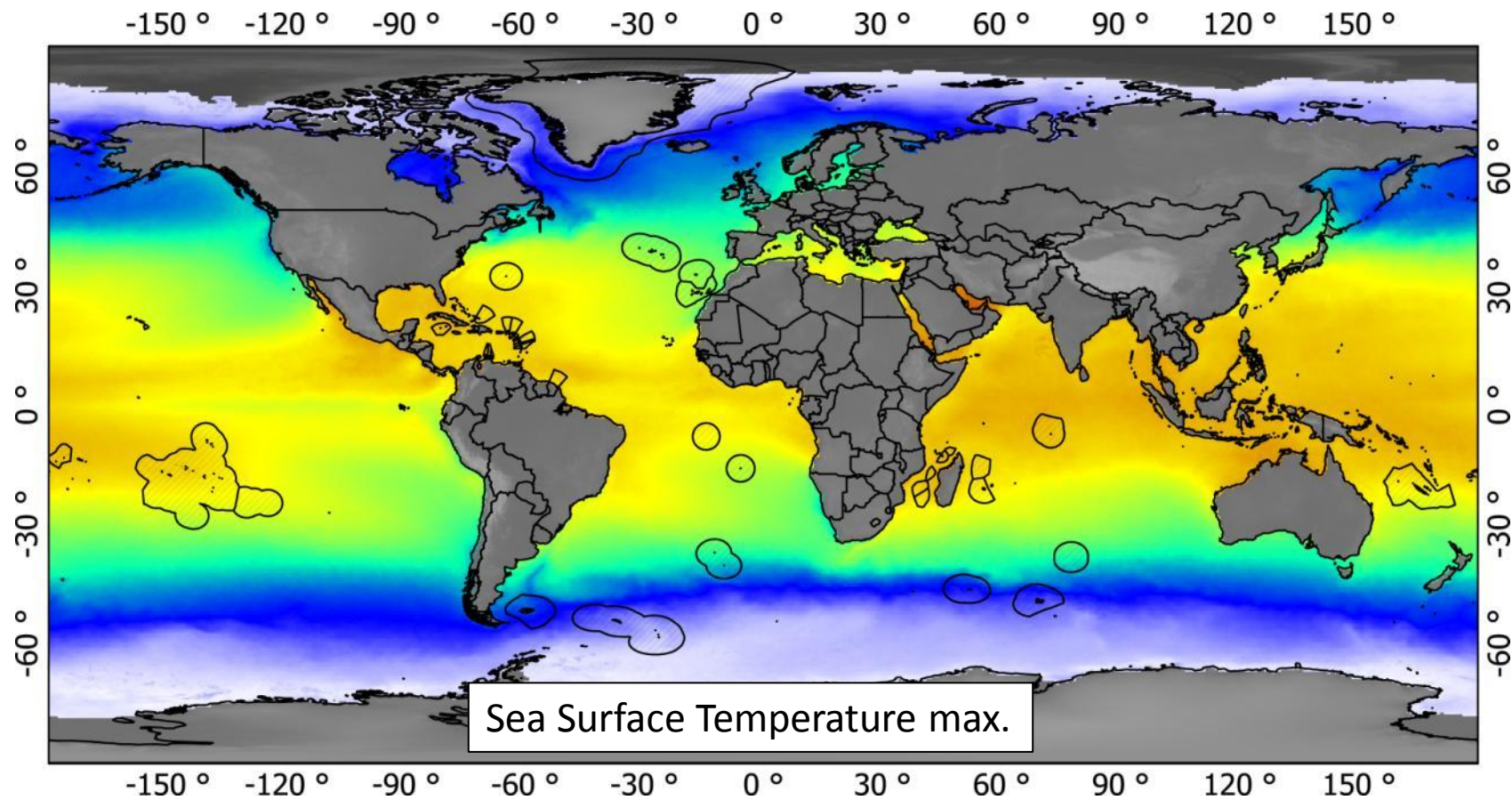
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## Variables:

Salinity	= Salinity
satmax_monthly	= Surface Air Temperature (max. warmest month)
satmean_monthly	= Surface Air Temperature (mean 12 months)
satmin_monthly	= Surface Air Temperature (min. coldest month)
satrang_monthly	= Surface Air Temperature range
sstmax_monthly	= Sea Surface Temperature (max. warmest month)
sstmean_monthly	= Sea Surface Temperature (mean 12 months)
sstmin_monthly	= Sea Surface Temperature (min. coldest month)
sstrang_monthly	= Sea Surface Temperature range
Bathymetric depth	= Depth in m



# Methodology - marine



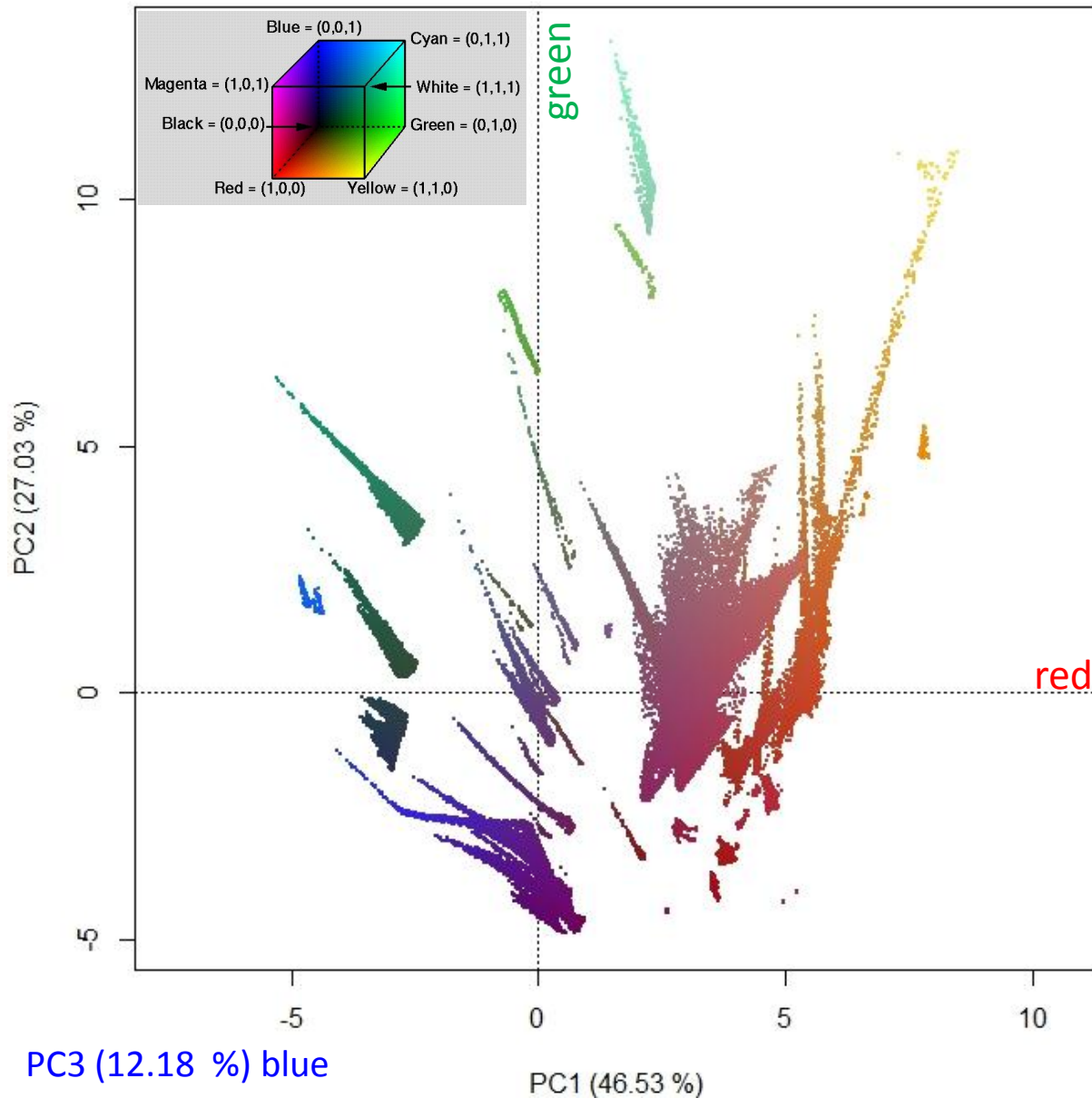
# Results - terrestrial

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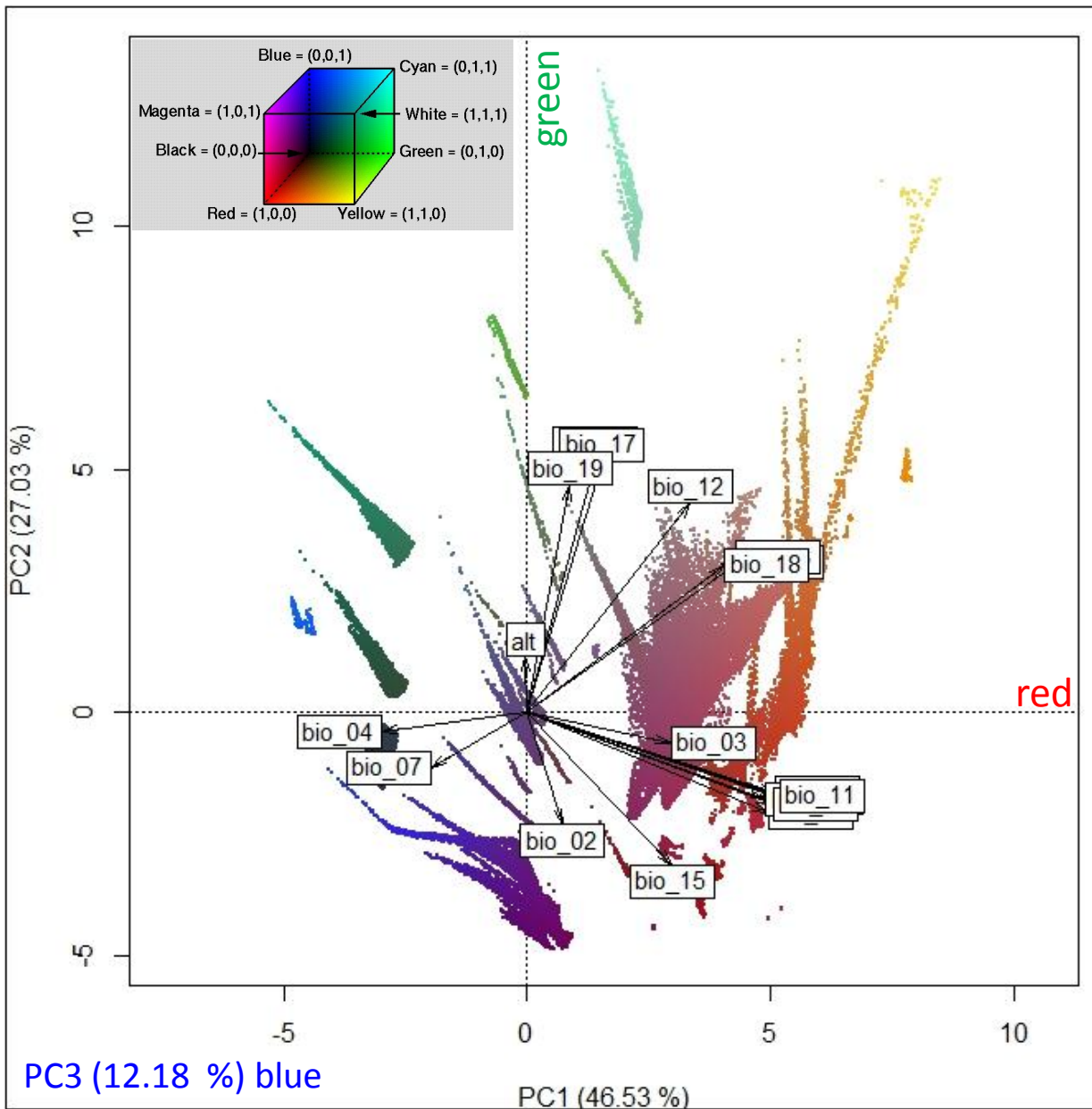
- Figure PCA
- Explain the PCA
- Map regions in PCA graph



# Results – terrestrial (French Guiana excluded)



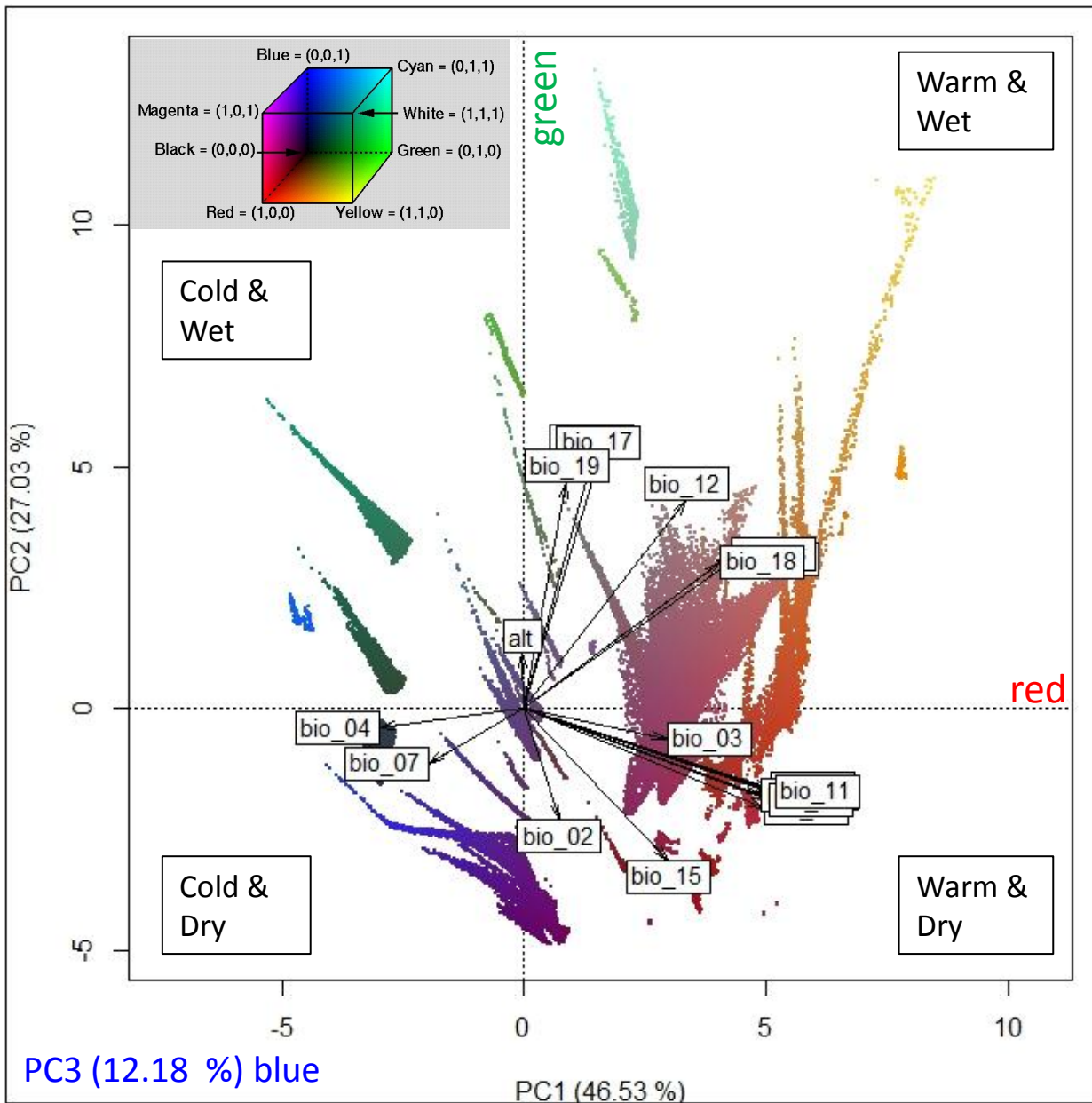
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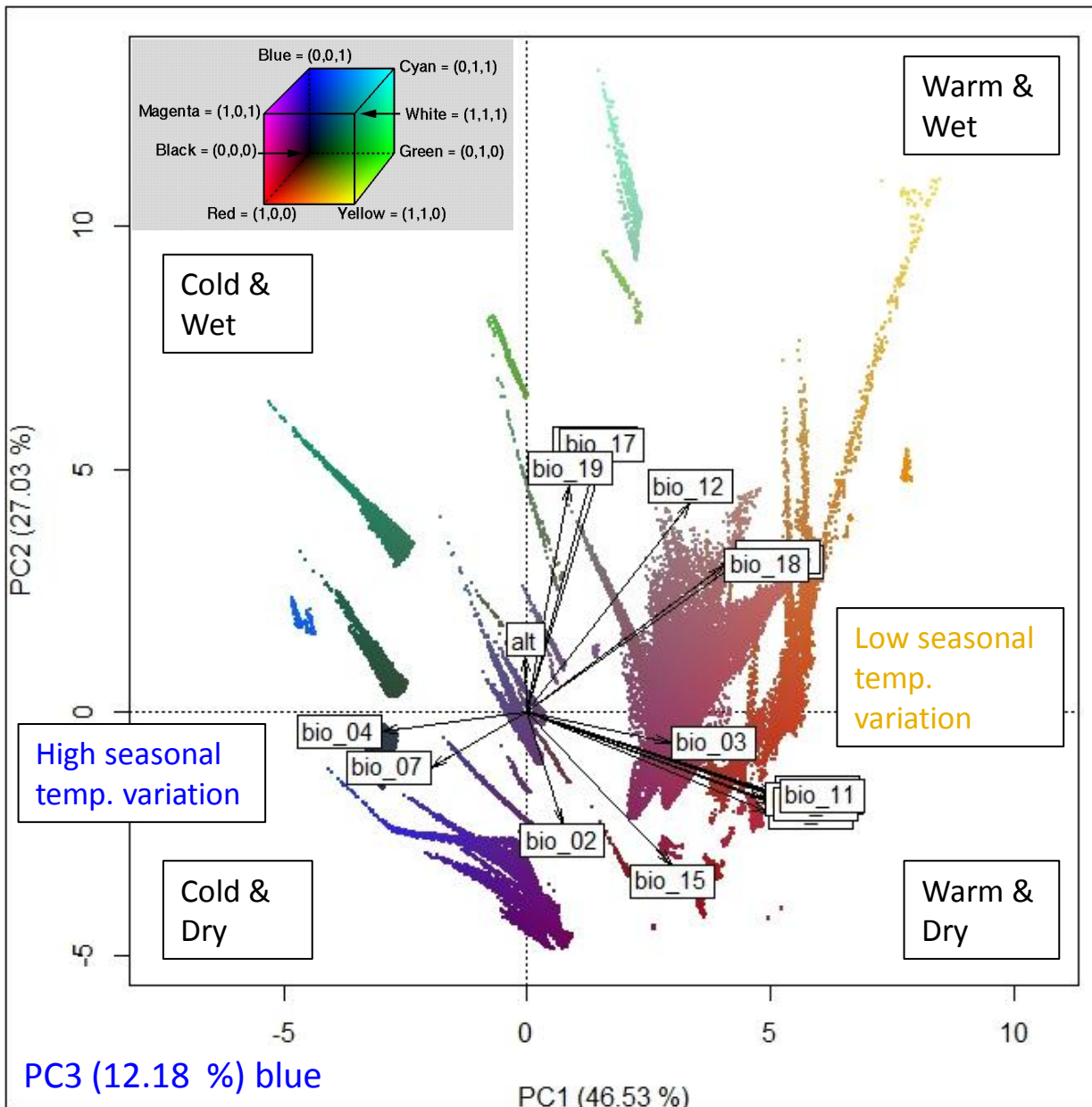
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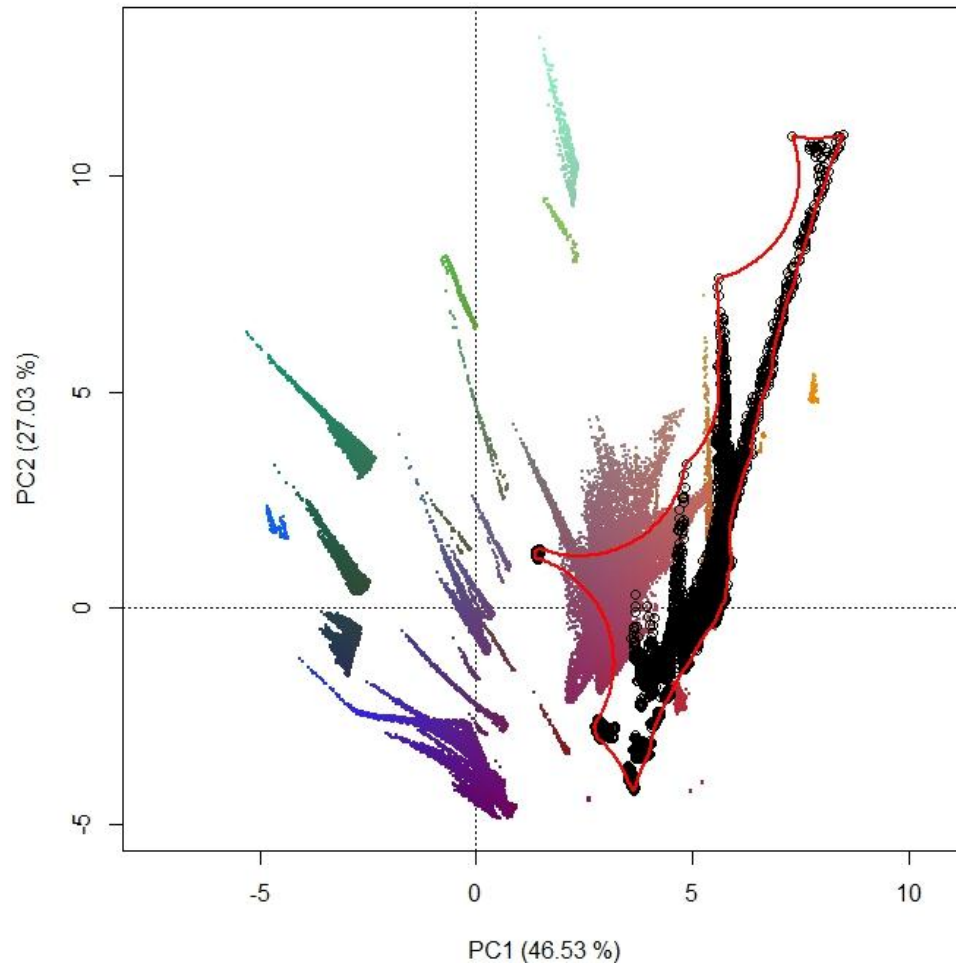
# Results – terrestrial (French Guiana excluded)



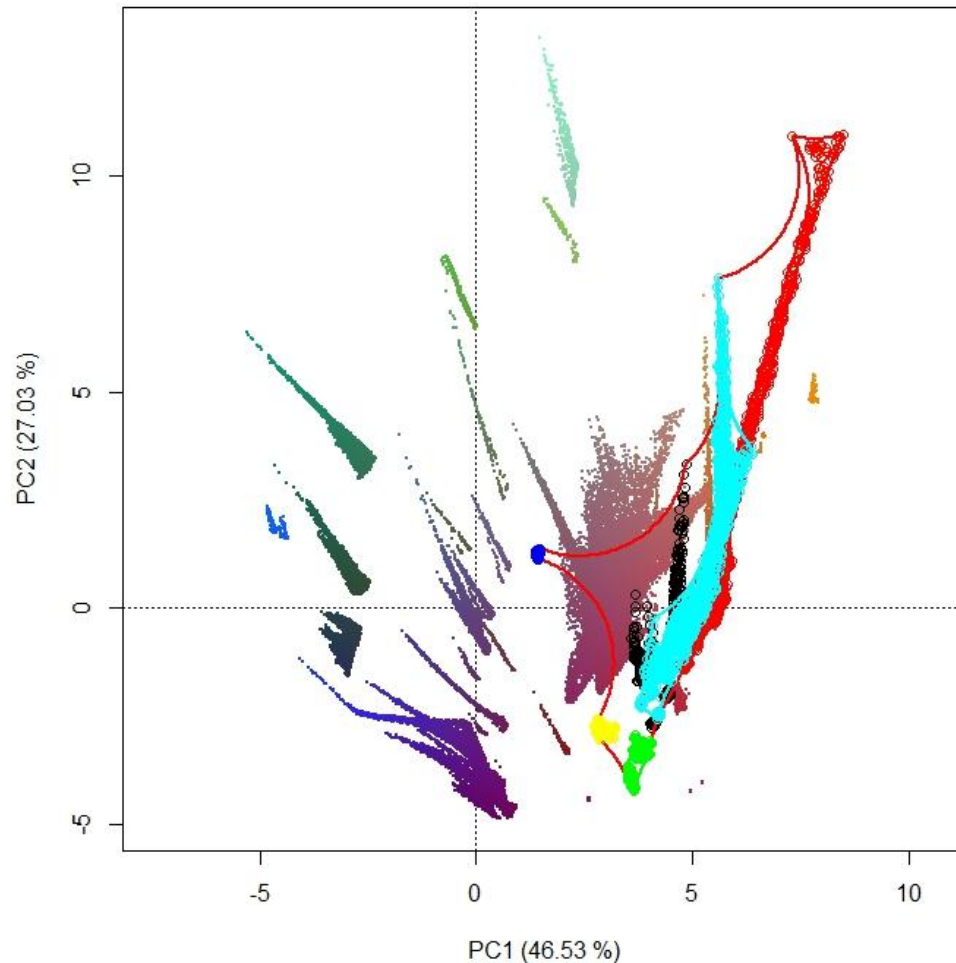
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# Results – terrestrial (French Guiana excluded)

Caribbean



# Results – terrestrial (French Guiana excluded)

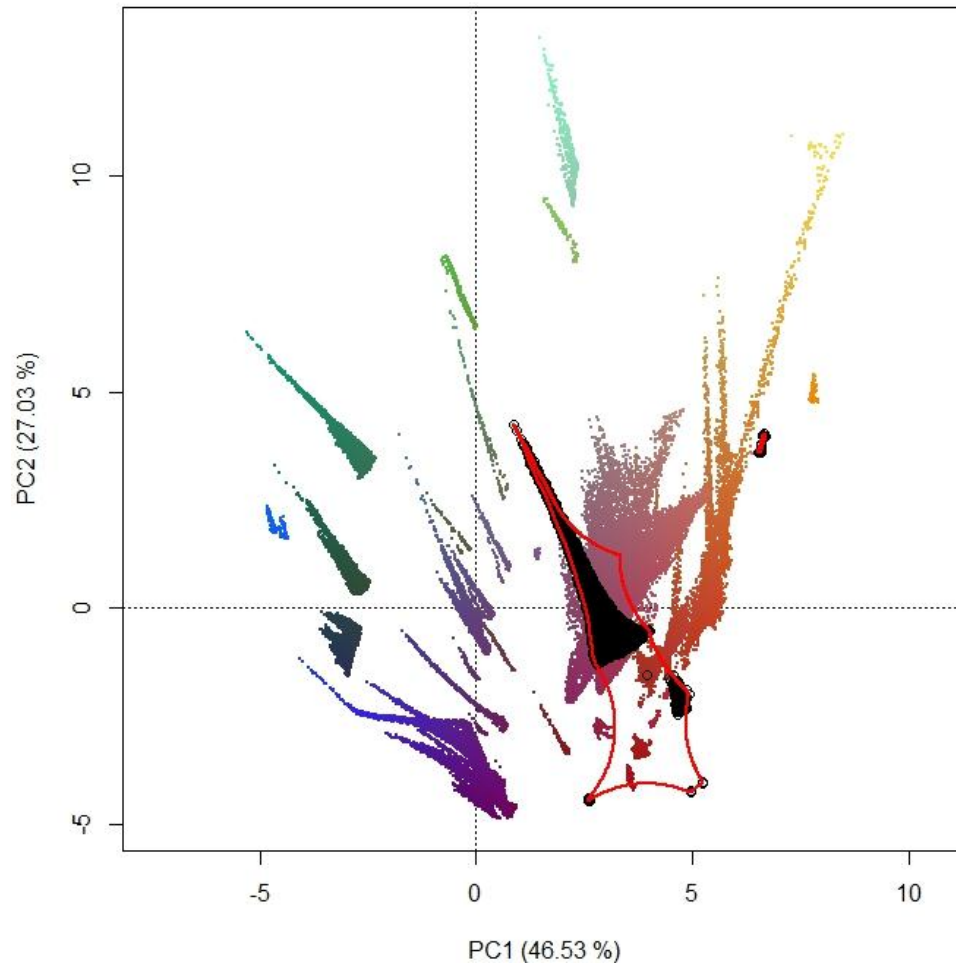


Caribbean:

- Martinique
- ABC Islands
- Bermuda
- Turks & Caicos Islands
- Guadeloupe



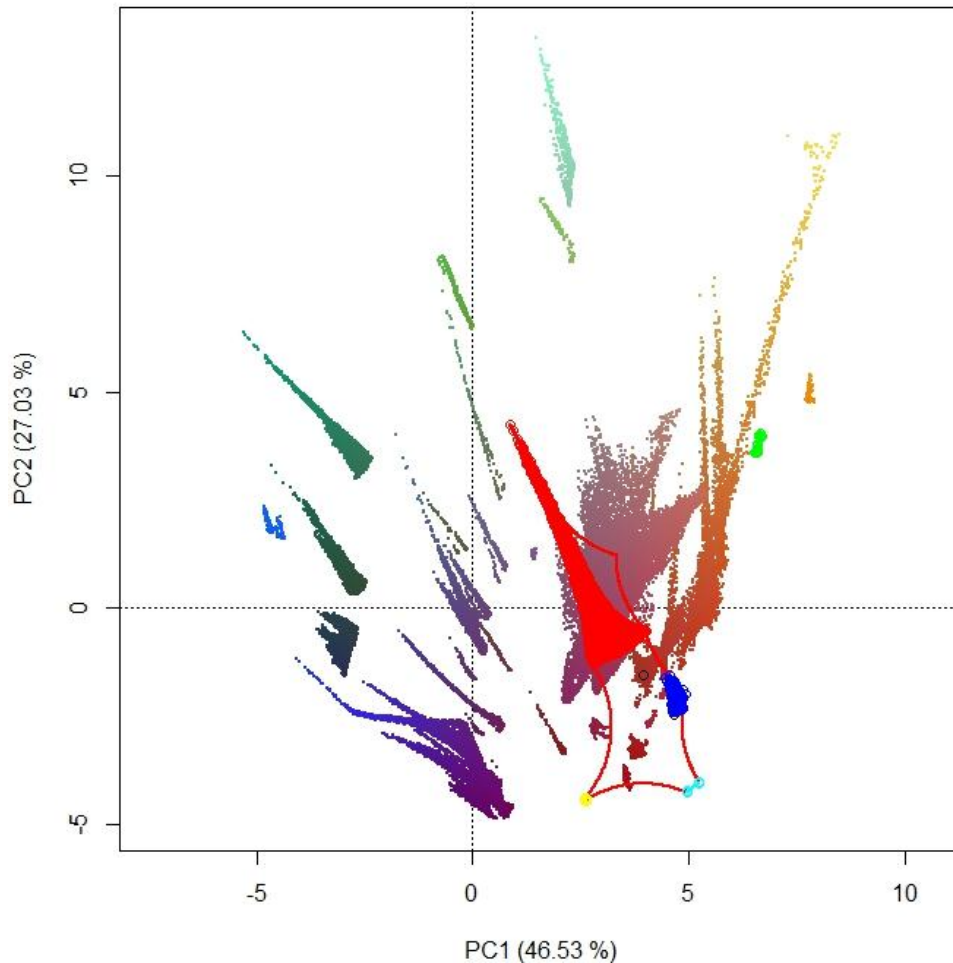
# Results – terrestrial (French Guiana excluded)



Caribbean  
Indian Ocean



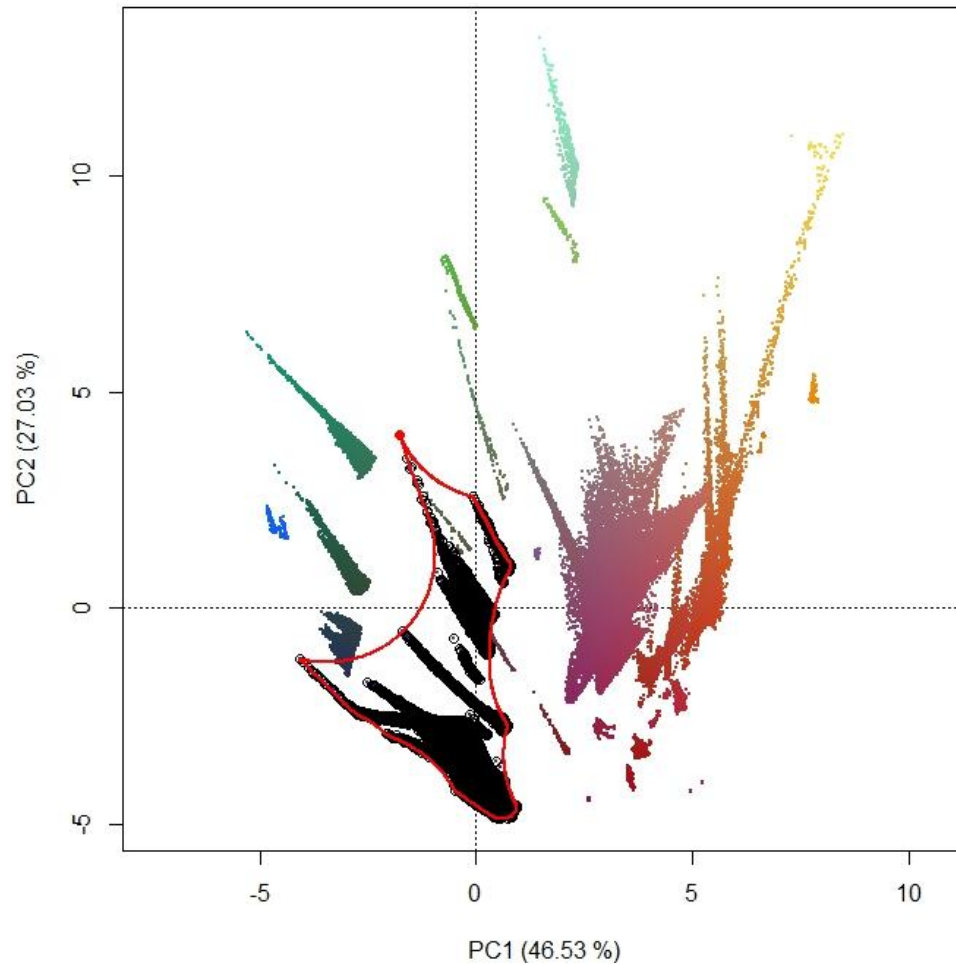
# Results – terrestrial (French Guiana excluded)



- Caribbean
- Indian Ocean
- Reunion
- BIOT
- Mayotte
- Ile de Europe
- Juan de Nova



# Results – terrestrial (French Guiana excluded)

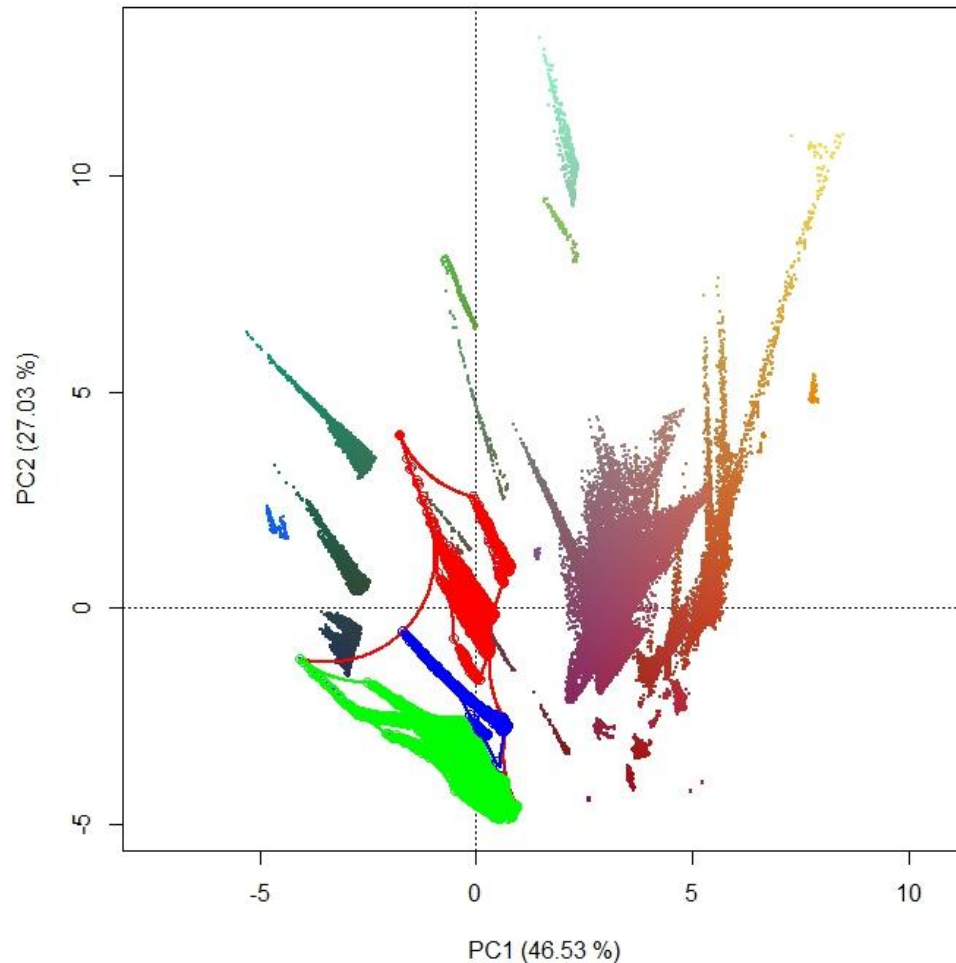


Caribbean  
Indian Ocean  
Macaronesia





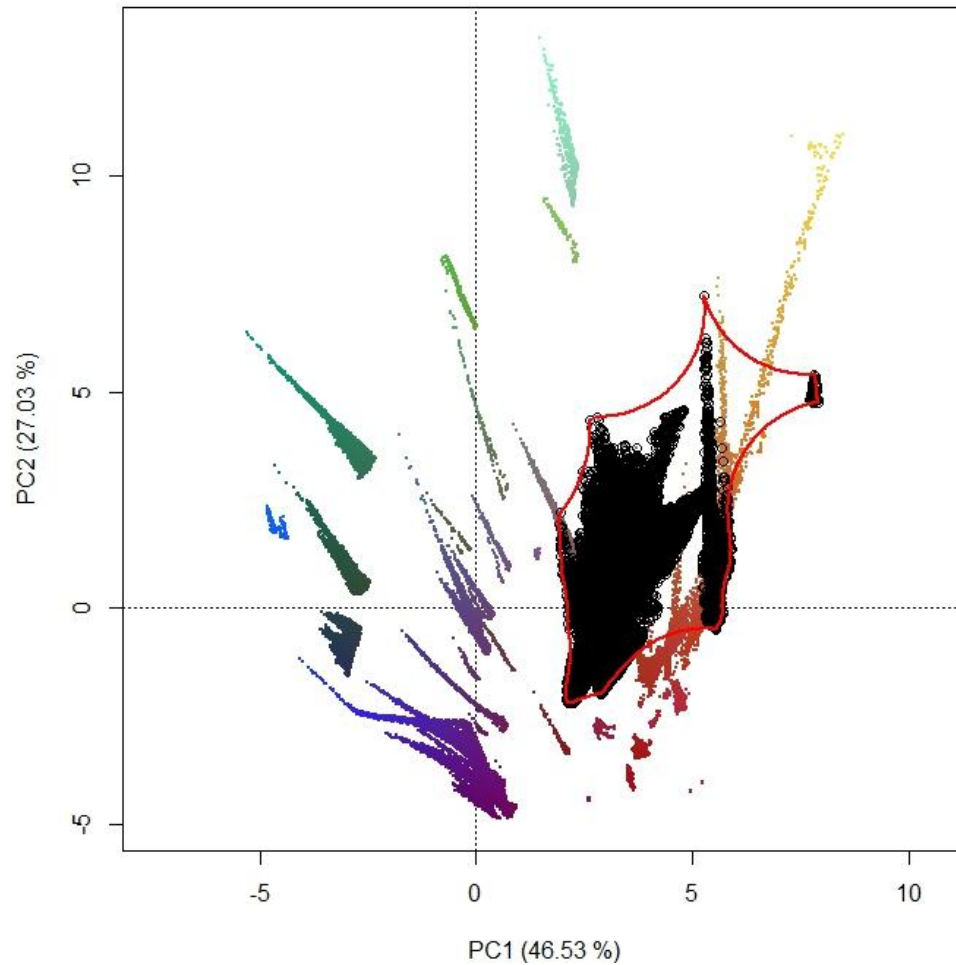
# Results – terrestrial (French Guiana excluded)



- Caribbean
- Indian Ocean
- Macaronesia
- Azores
- Canary Islands
- Madeira



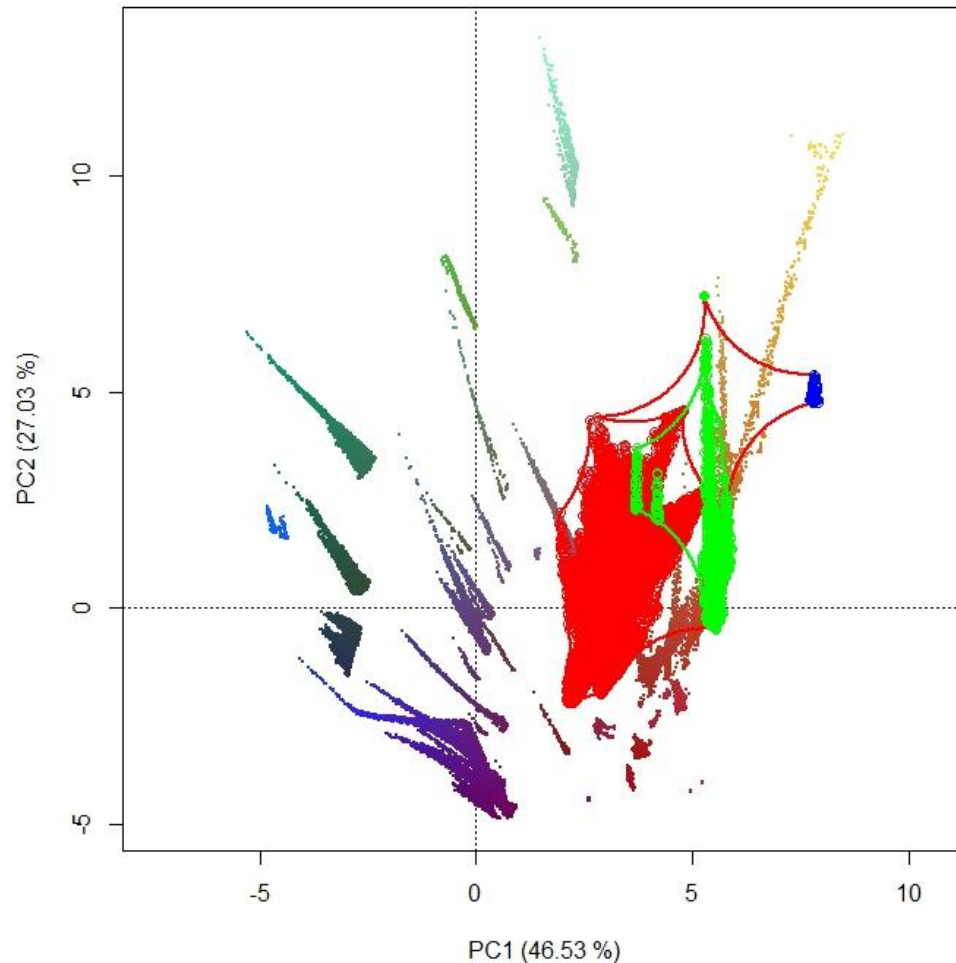
# Results – terrestrial (French Guiana excluded)



Caribbean  
Indian Ocean  
Macaronesia  
Pacific



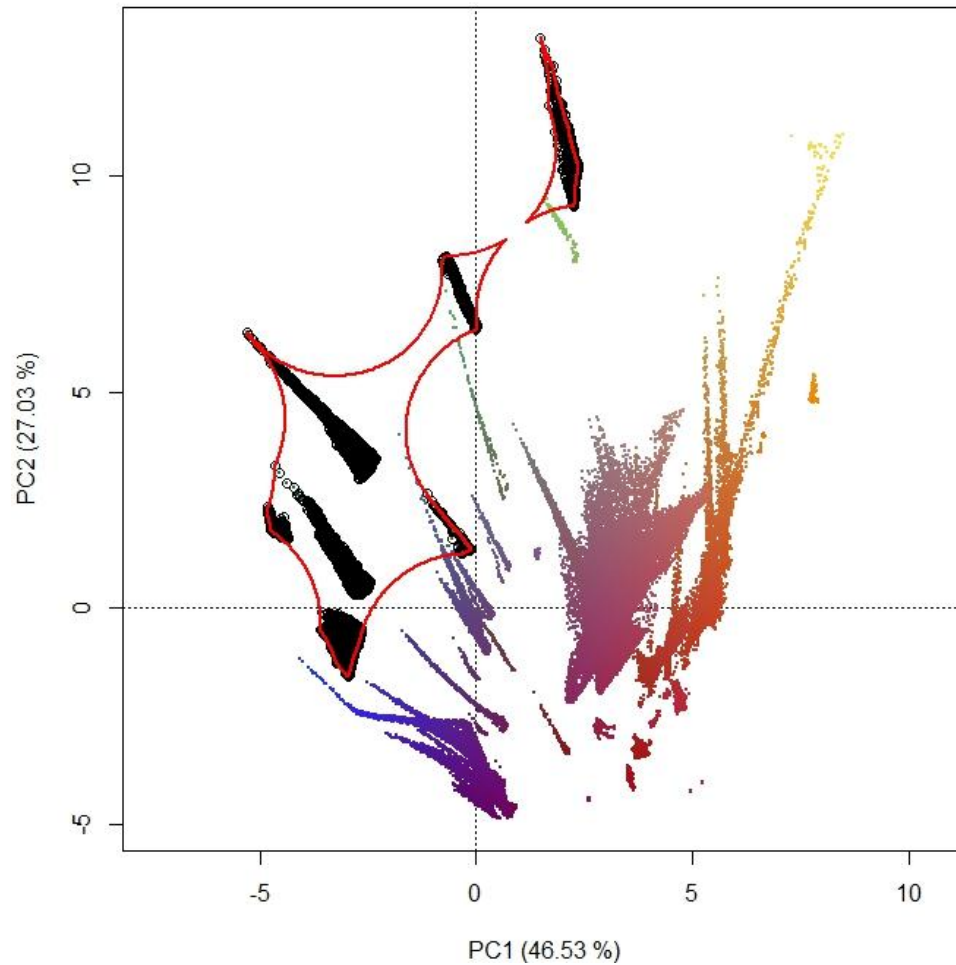
# Results – terrestrial (French Guiana excluded)



- Caribbean
- Indian Ocean
- Macaronesia
- Pacific
- New Caledonia
- French Polynesia
- Wallis & Futuna



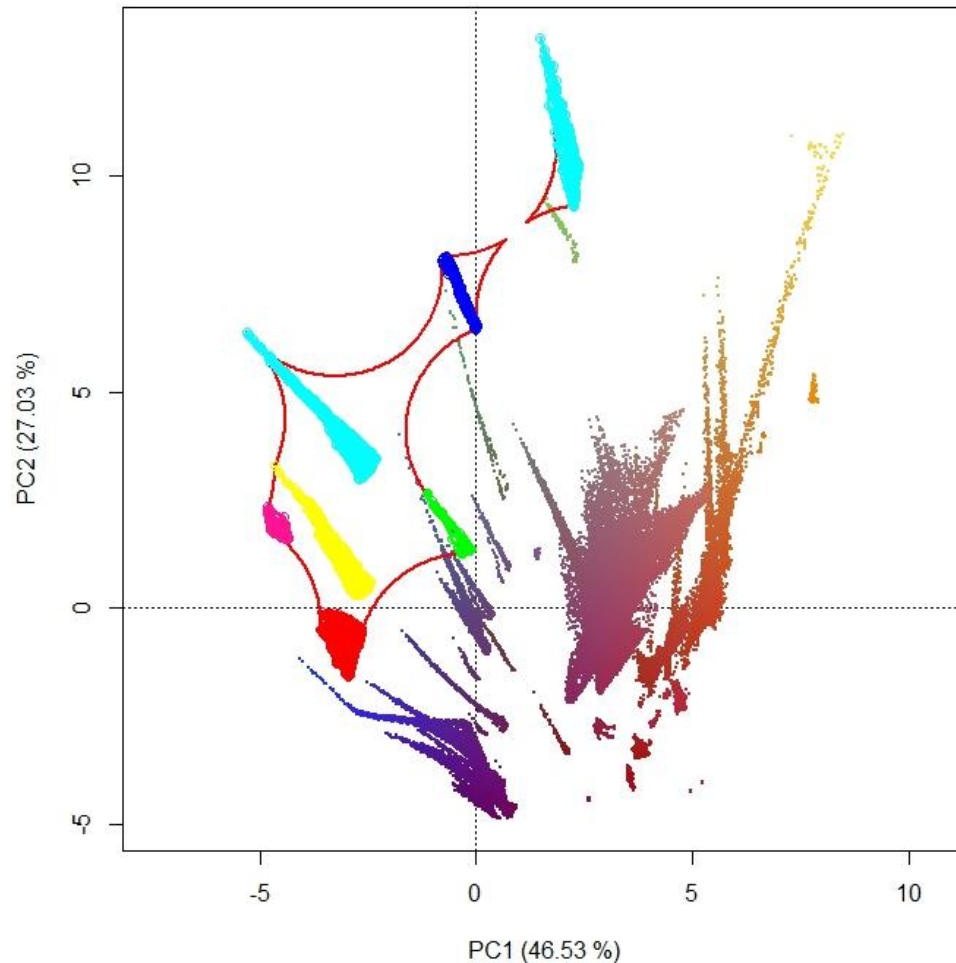
# Results – terrestrial (French Guiana excluded)



Caribbean  
Indian Ocean  
Macaronesia  
Pacific  
Polar/Sub-polar



# Results – terrestrial (French Guiana excluded)



Caribbean

Indian Ocean

Macaronesia

Pacific

Polar/Sub-polar

- Falkland Islands

- Amsterdam & St. Paul

- Crozet Islands

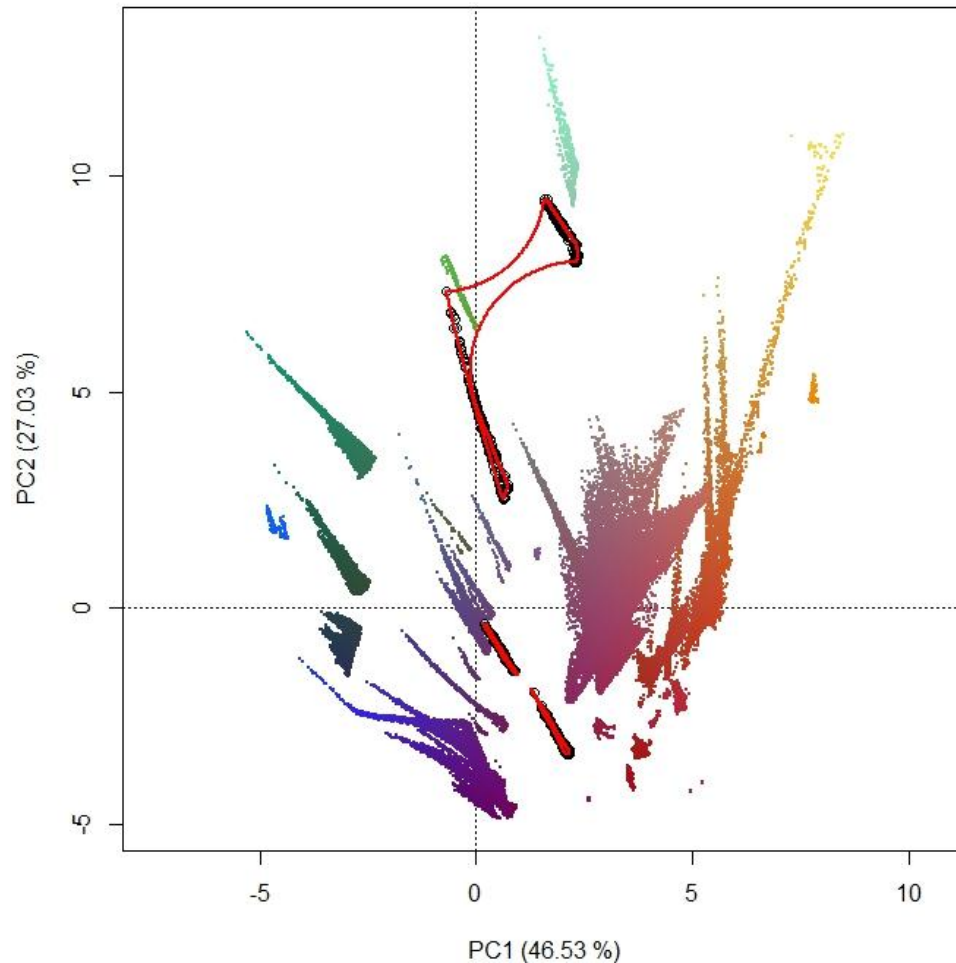
- Kerguelen

- South Georgia & Sandwich  
Islands

- St. Pierre & Miquelon



# Results – terrestrial (French Guiana excluded)

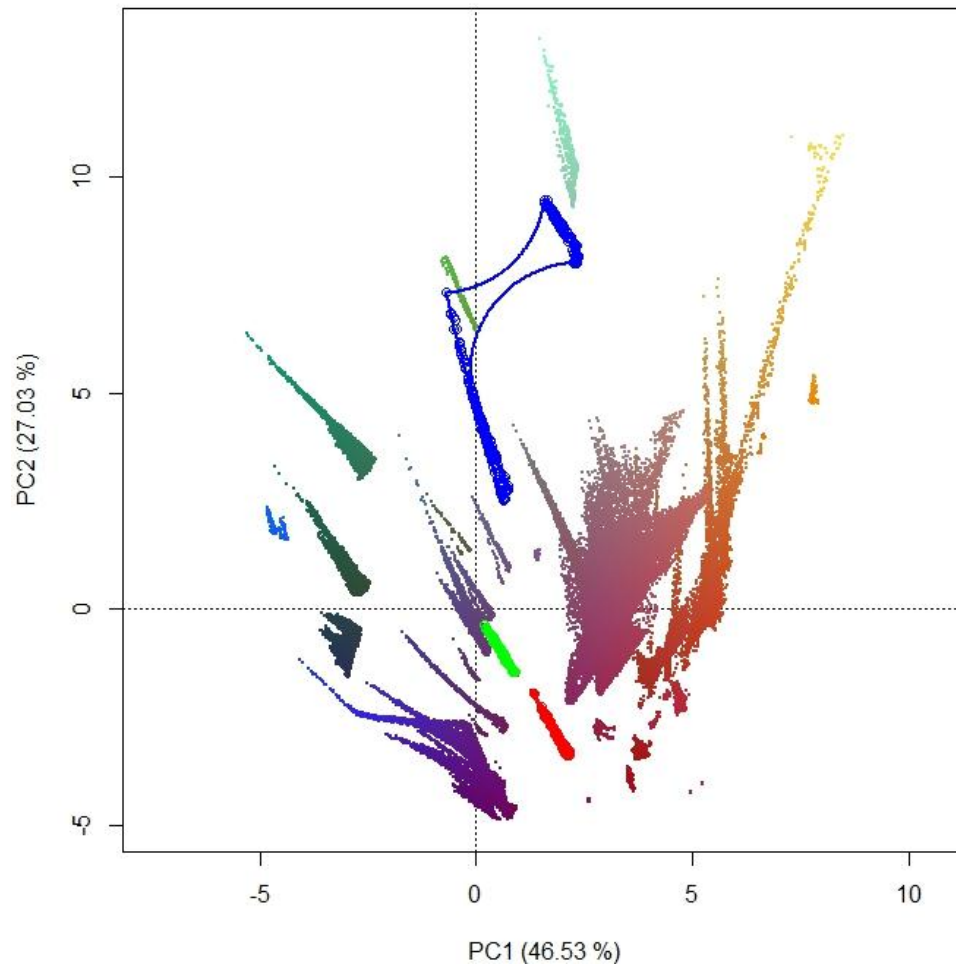


Caribbean  
Indian Ocean  
Macaronesia  
Pacific  
Polar/Sub-polar  
South Atlantic



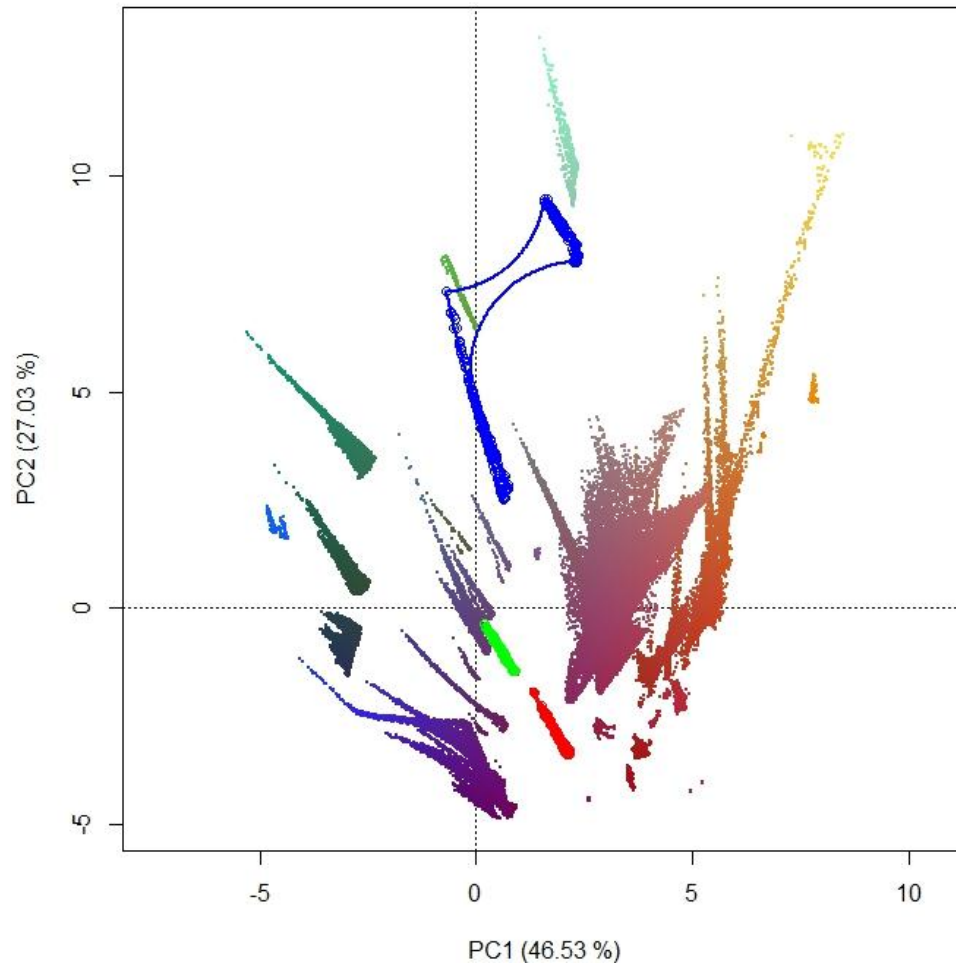


# Results – terrestrial (French Guiana excluded)



- Caribbean
- Indian Ocean
- Macaronesia
- Pacific
- Polar/Sub-polar
- South Atlantic
- Ascension
- St. Helena
- Tristan da Cunha

# Results – terrestrial (French Guiana excluded)

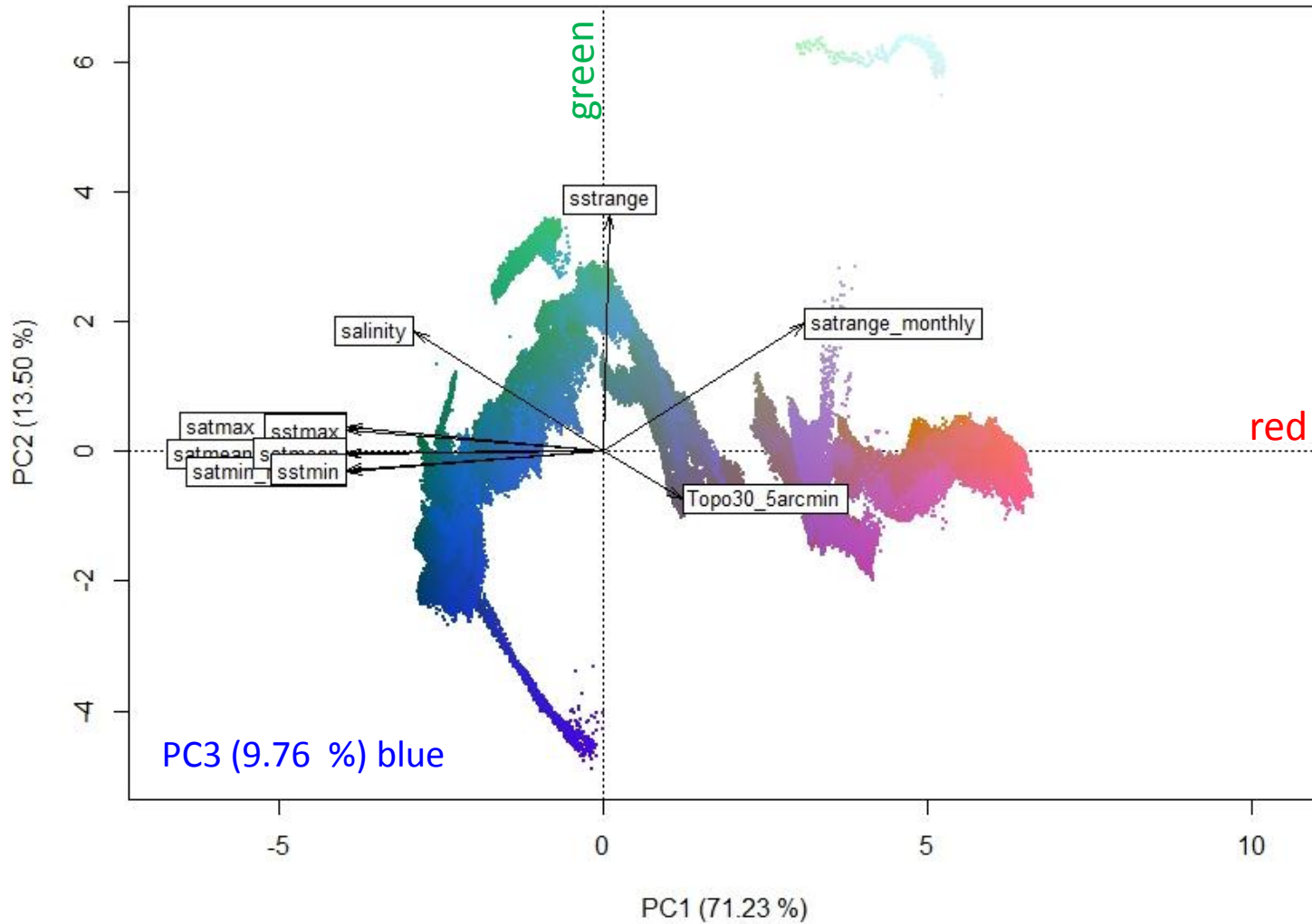


- Caribbean
- Indian Ocean
- Macaronesia
- Pacific
- Polar/Sub-polar
- South Atlantic
- Ascension
- St. Helena
- Tristan da Cunha

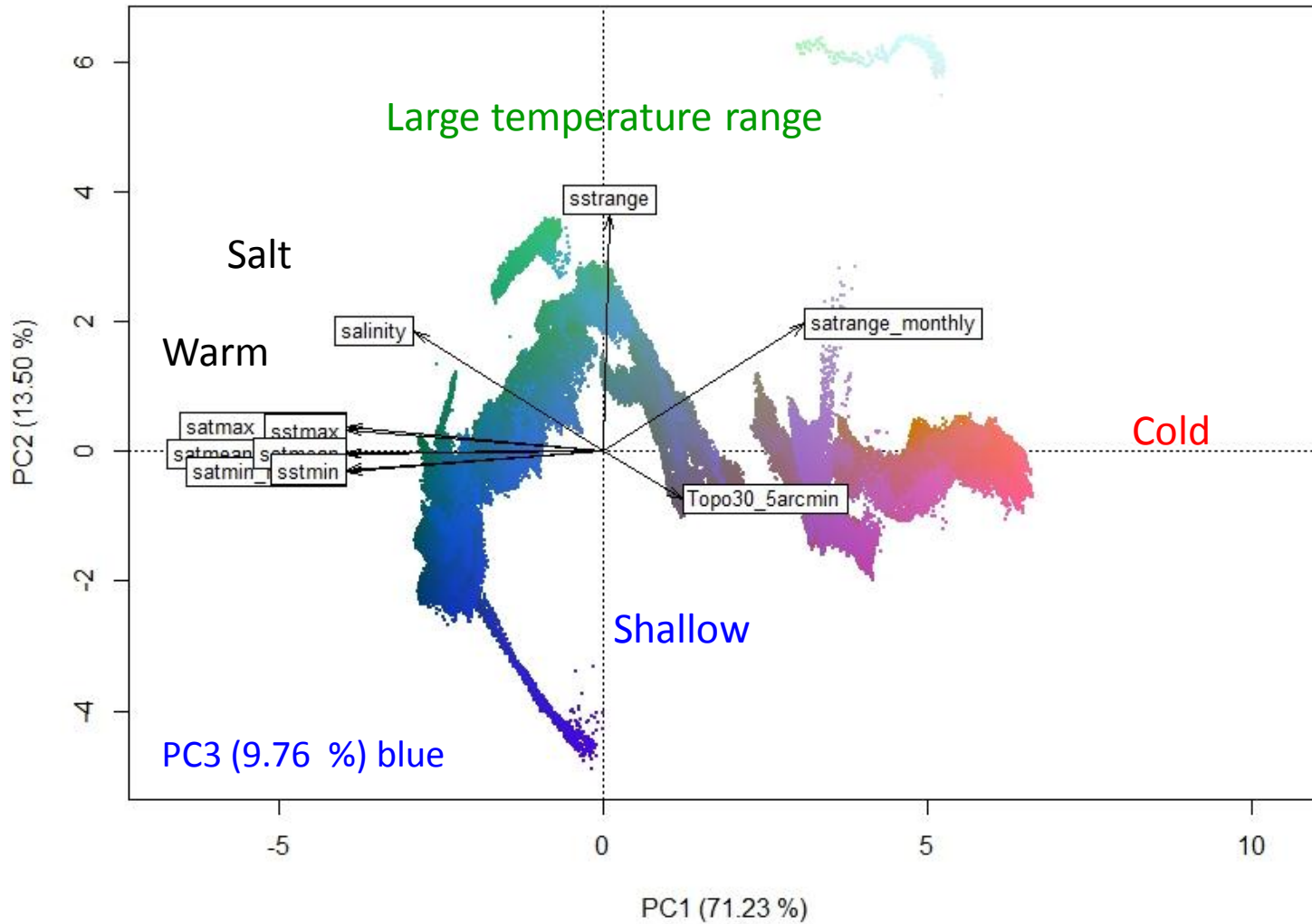
*Amazon - excluded*



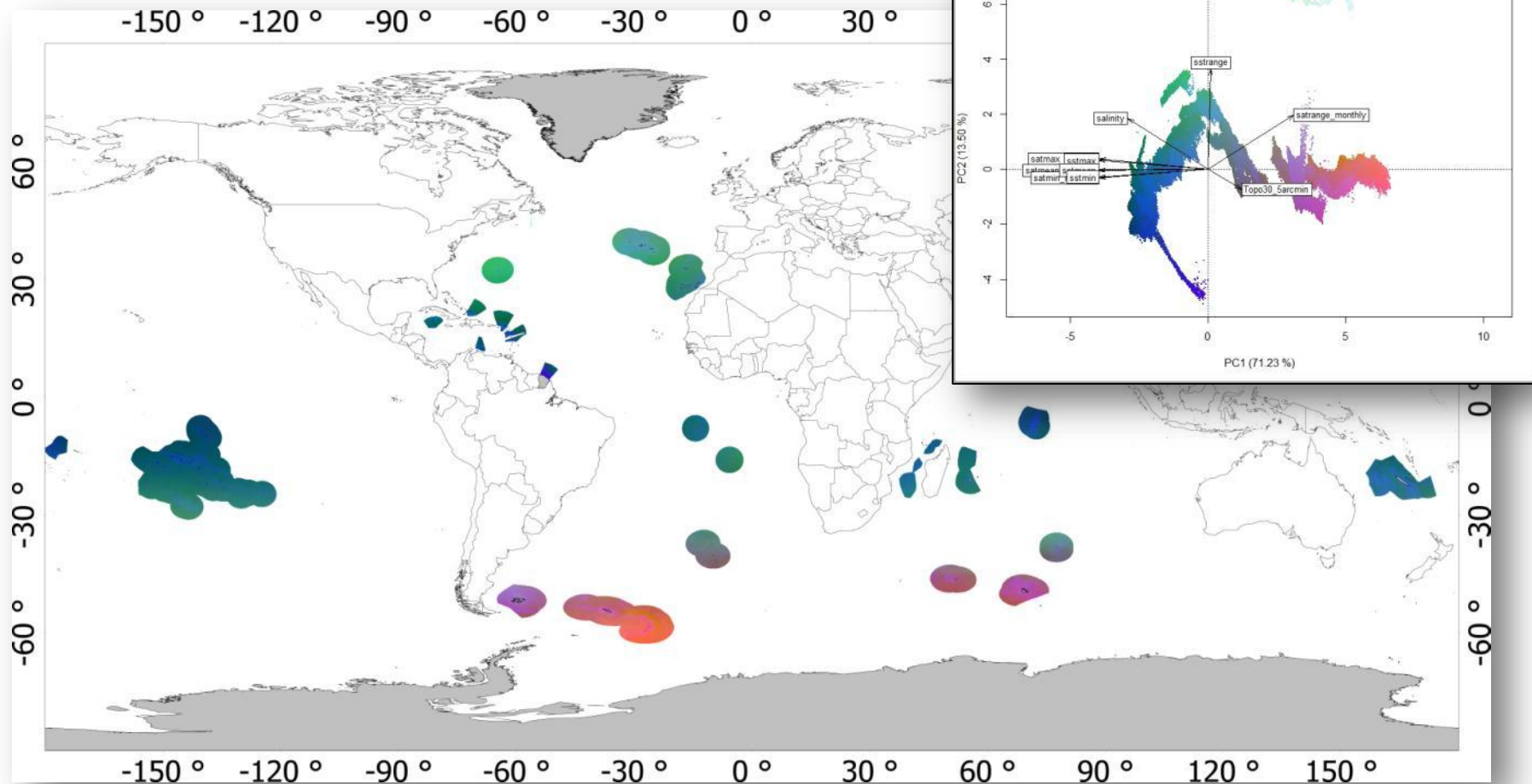
# Results - marine



# Results - marine

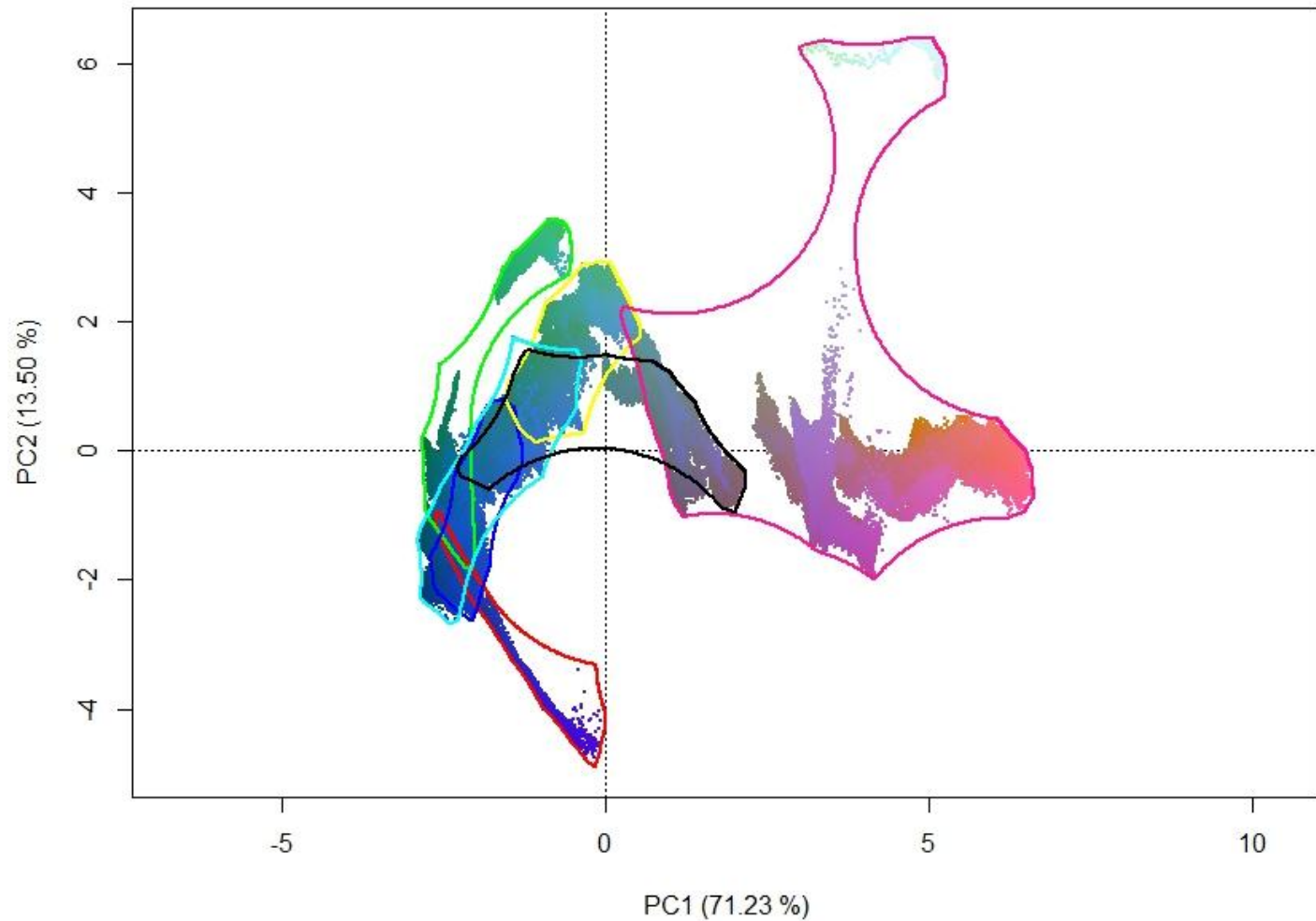


# Results - marine



# Results - marine

Amazon  
Caribbean  
Indian Ocean  
Macaronesia  
Pacific  
Polar/Sub-polar  
South Atlantic

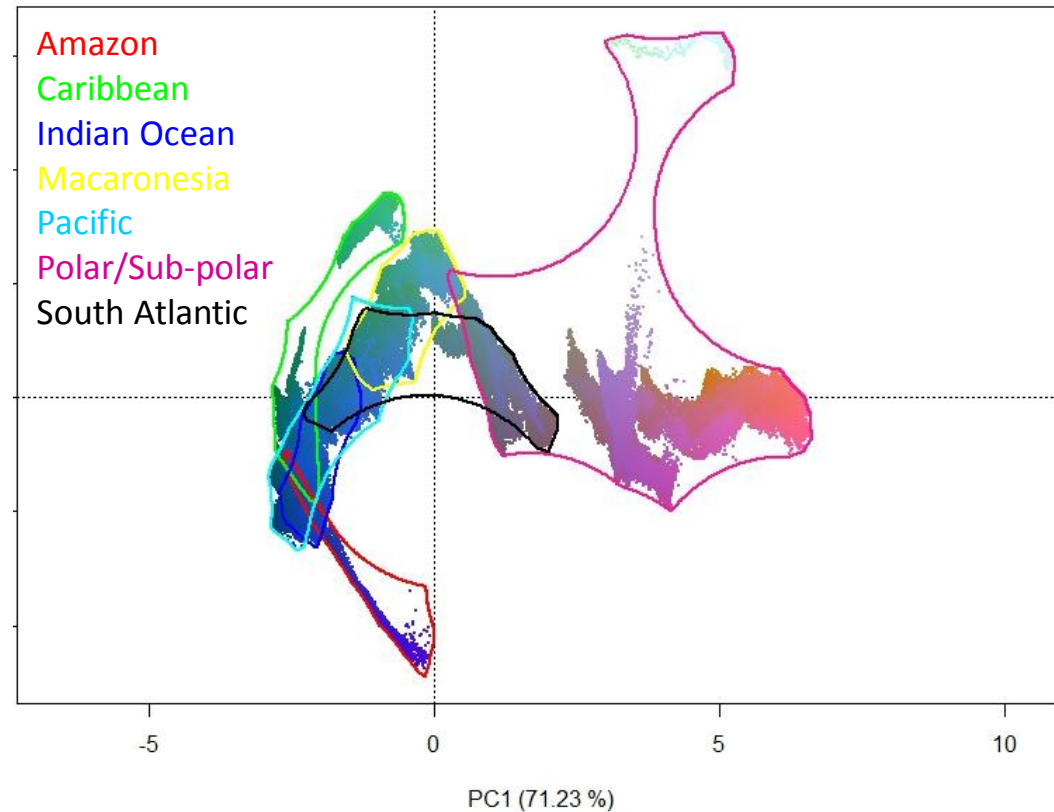
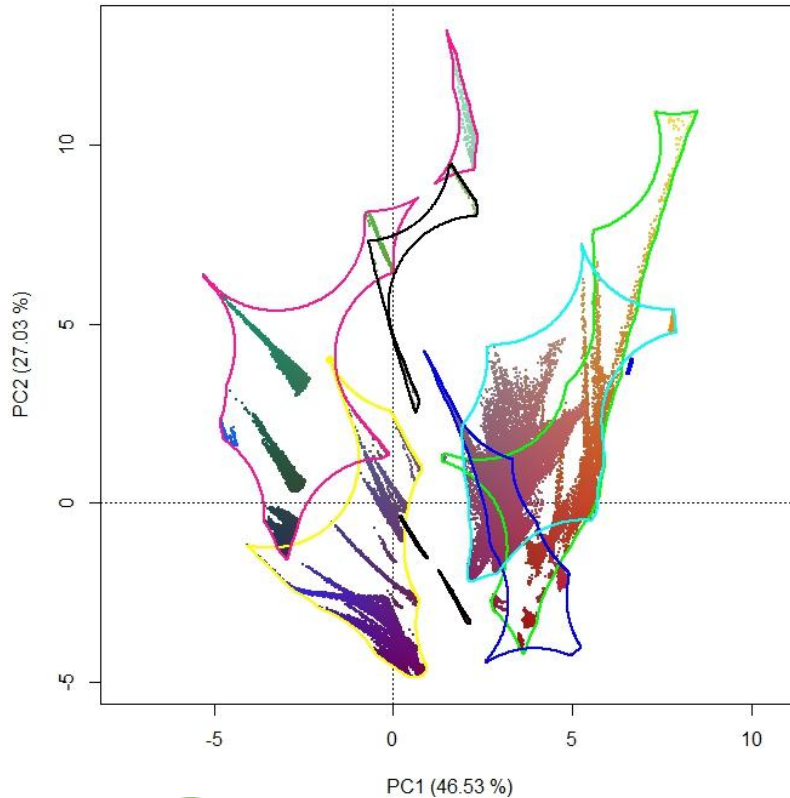


# Recommendations and Conclusions

T: Caribbean, Indian Ocean and Pacific share bioclimatic similar conditions.

T: Macaronesia and Polar/Sub-polar are unique.

T: South Atlantic is intermediate.



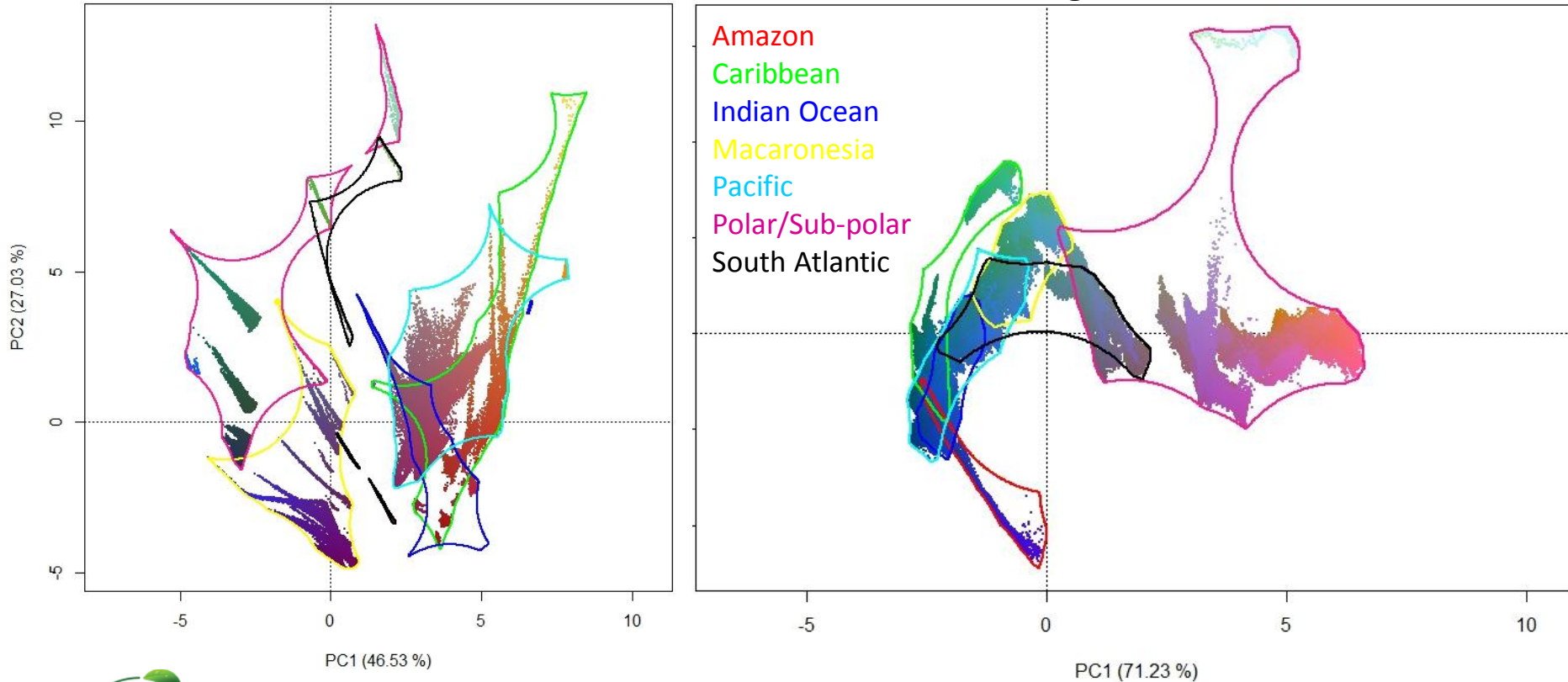


# Recommendations and Conclusions

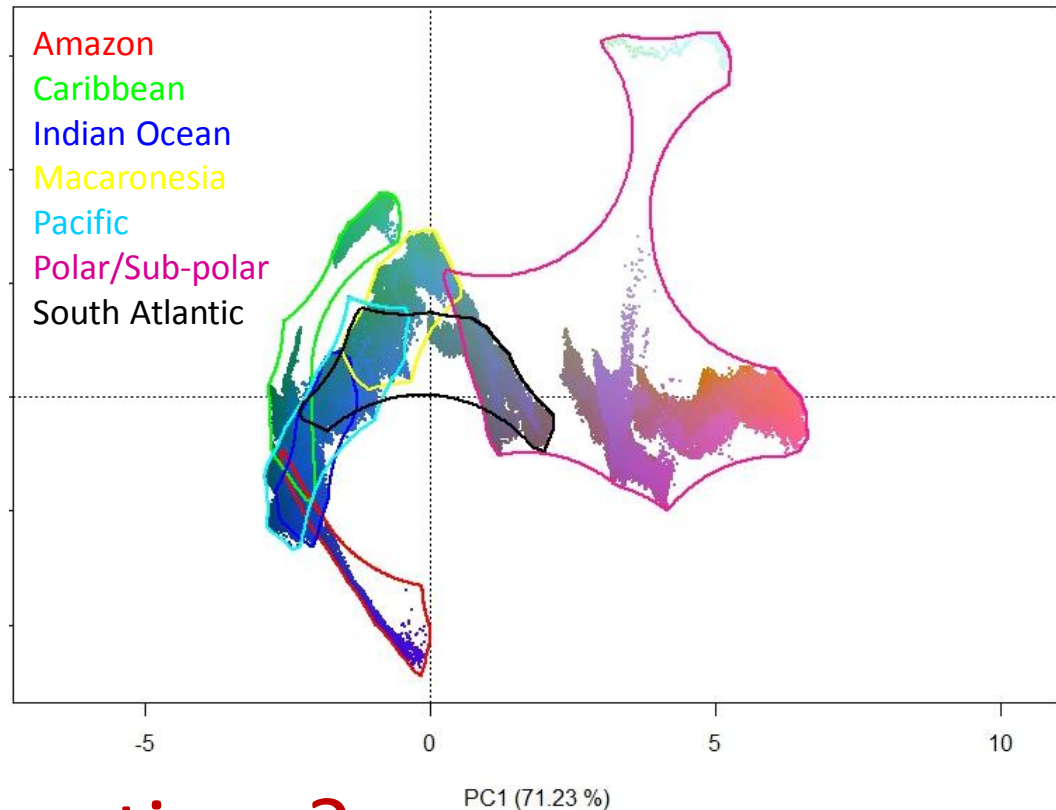
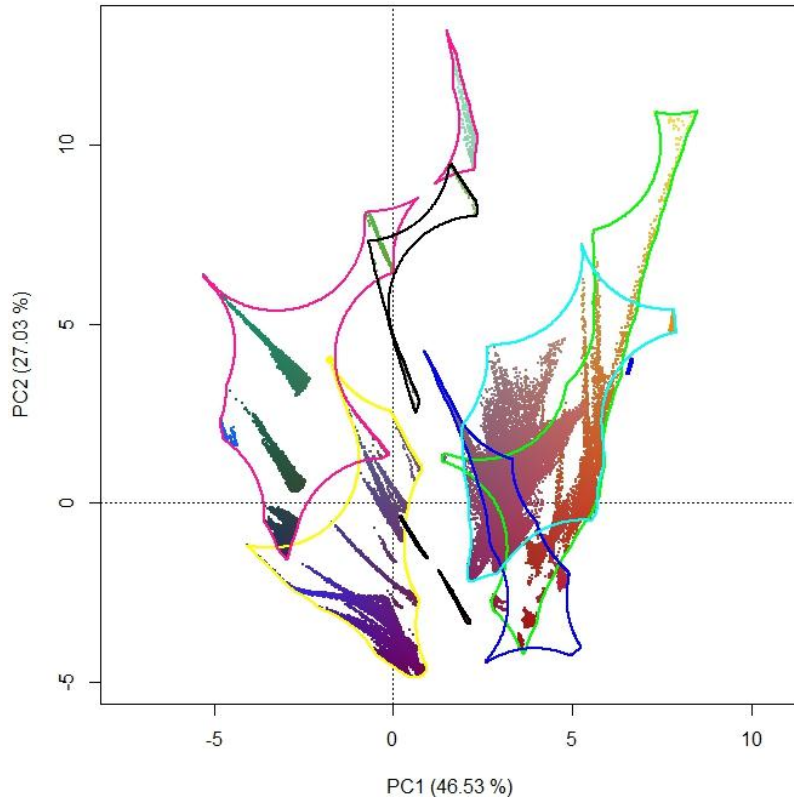
M: Amazon, Caribbean, Macaronesia and Polar/Sub-polar have (some) unique bioclimatic conditions.

M: Indian Ocean and Pacific share similar bioclimatic condition.

M: South Atlantic shares bioclimatic conditions with most regions.



# Recommendations and Conclusions



Questions?