Spatial data sources for species distribution modeling

Species Distribution Modeling for Conservation in R and Wallace workshop
October 4th 2019

Environmental data

WorldClim - Global Climate Data

Free climate data for ecological modeling and GIS

- The 19 bioclimatic variables from the Worldclim database are the more widely used! But **not** the only available dataset!

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
BIO6 = Min Temperature of Coldest Month
BIO7 = Temperature Annual Range (BIO5-BIO6)
BIO8 = Mean Temperature of Wettest Quarter
BIO9 = Mean Temperature of Driest Quarter
BIO10 = Mean Temperature of Warmest Quarter
BIO11 = Mean Temperature of Coldest Quarter
BIO12 = Annual Precipitation
BIO13 = Precipitation of Wettest Month
BIO14 = Precipitation of Driest Month
BIO15 = Precipitation Seasonality (Coefficient of Variation)
BIO16 = Precipitation of Wettest Quarter
BIO17 = Precipitation of Driest Quarter
BIO18 = Precipitation of Warmest Quarter
BIO19 = Precipitation of Coldest Quarter

Some other databases

CHELSA

Climatologies at high resolution for the earth's land surface areas

19 Bioclimatic variables
Monthly Temperature and Precipitation
~1km

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2016)

RESEARCH PAPER

Remotely sensed temperature and precipitation data improve species distribution modelling in the tropics

V. Deblauwe[1,2,3]*, V. Droissart[2,3,4,5], R. Bose[4,6], B. Sonké[3], A. Blach-Overgaard[7], J.-C. Svenning[7], J. J. Wieringa[8], B. R. Ramesh[6], T. Stévart[2,5] and T. L. P. Couvreur[1,3,8]

19 Bioclimatic variables
from MODIS and Chirps
~1km

ENVIREM

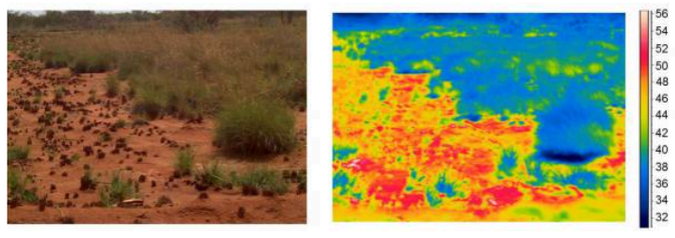
ENVIRONMENTAL RASTERS FOR ECOLOGICAL MODELING

Topographic indexes
Aridity
Evapotranspiration
~1km

EarthEnv

Cloud cover
Habitat heterogeneity
Freshwater
~1km

microclim – a global microclimate data set



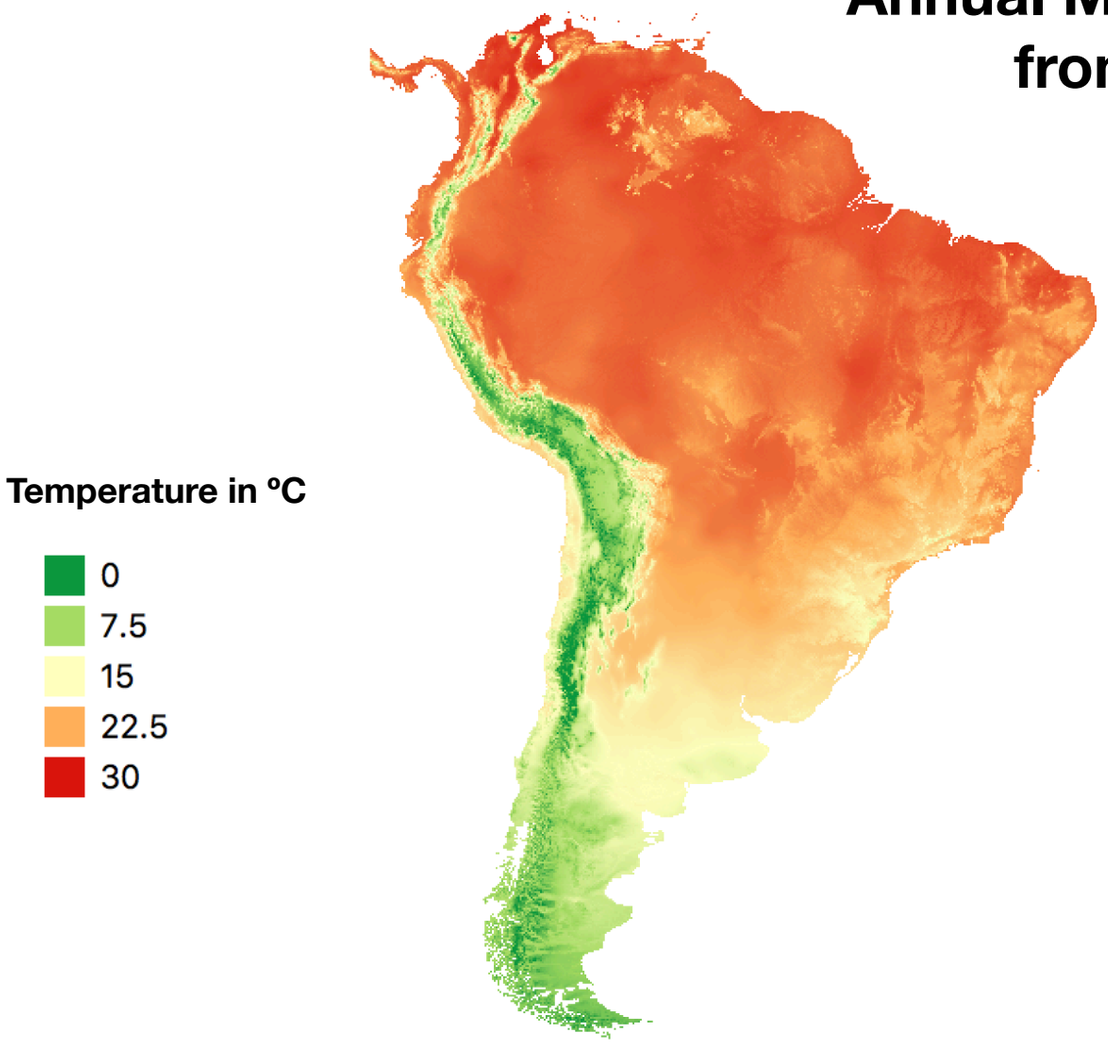
For marine data

~10km

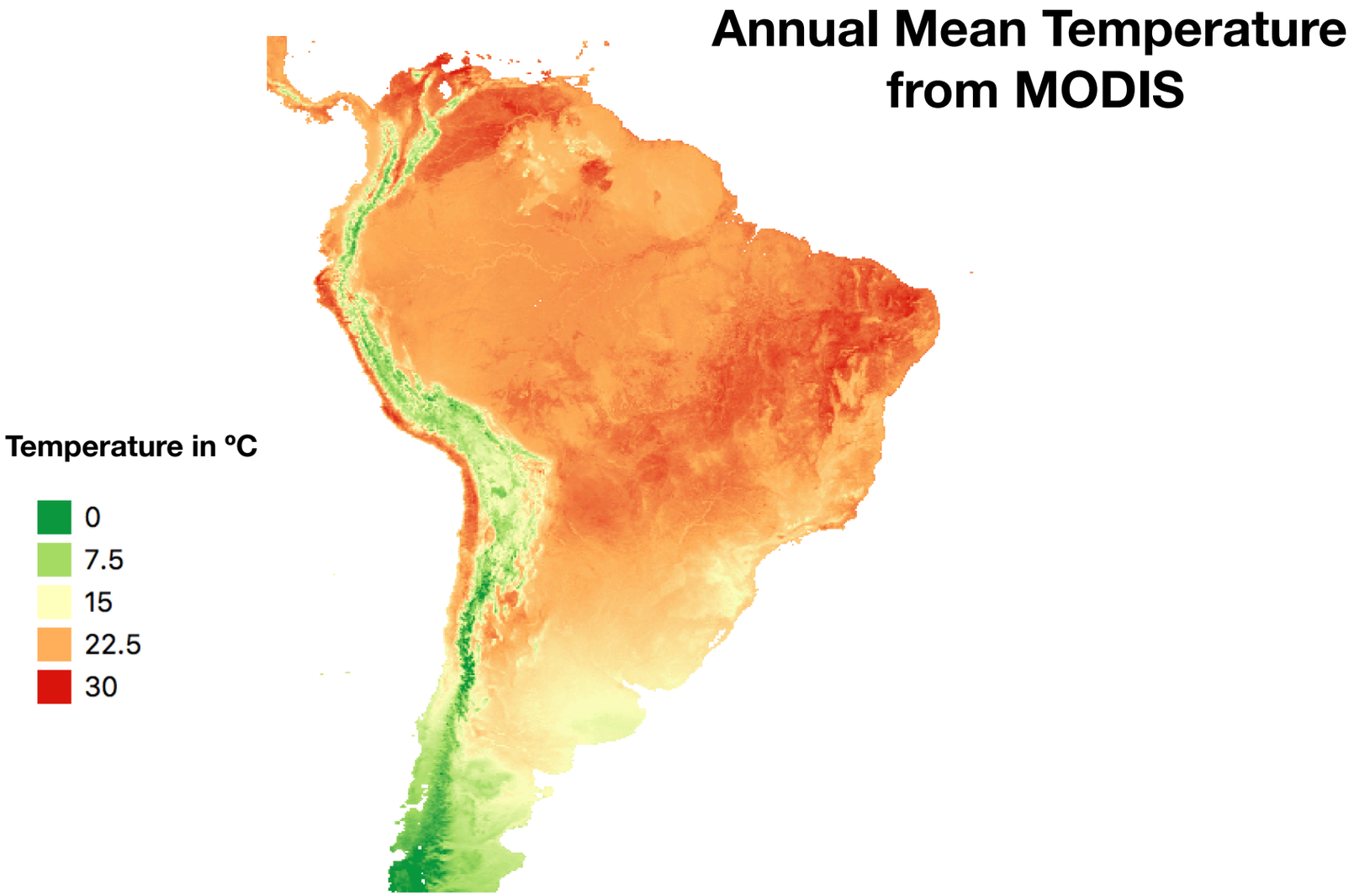
Layer	Unit
Temperature	°C
Salinity	PSS
Currents velocity	m-1
Ice thickness	m
Sea ice concentration	Fraction
Nitrate	mol.m-3
Phosphate	mol.m-3
Silicate	mol.m-3
Dissolved molecular oxygen	mol.m-3
Iron	umol.m-3
Chlorophyll	mg.m-3
Phytoplankton	umol.m-3
Primary productivity	g.m-3.day-1
Calcite	mol.m-3
pH	-
Photosynt. Avail. Radiation	E.m-2.day-1
Diffuse attenuation	m-1
Cloud cover	%

Are they the same?

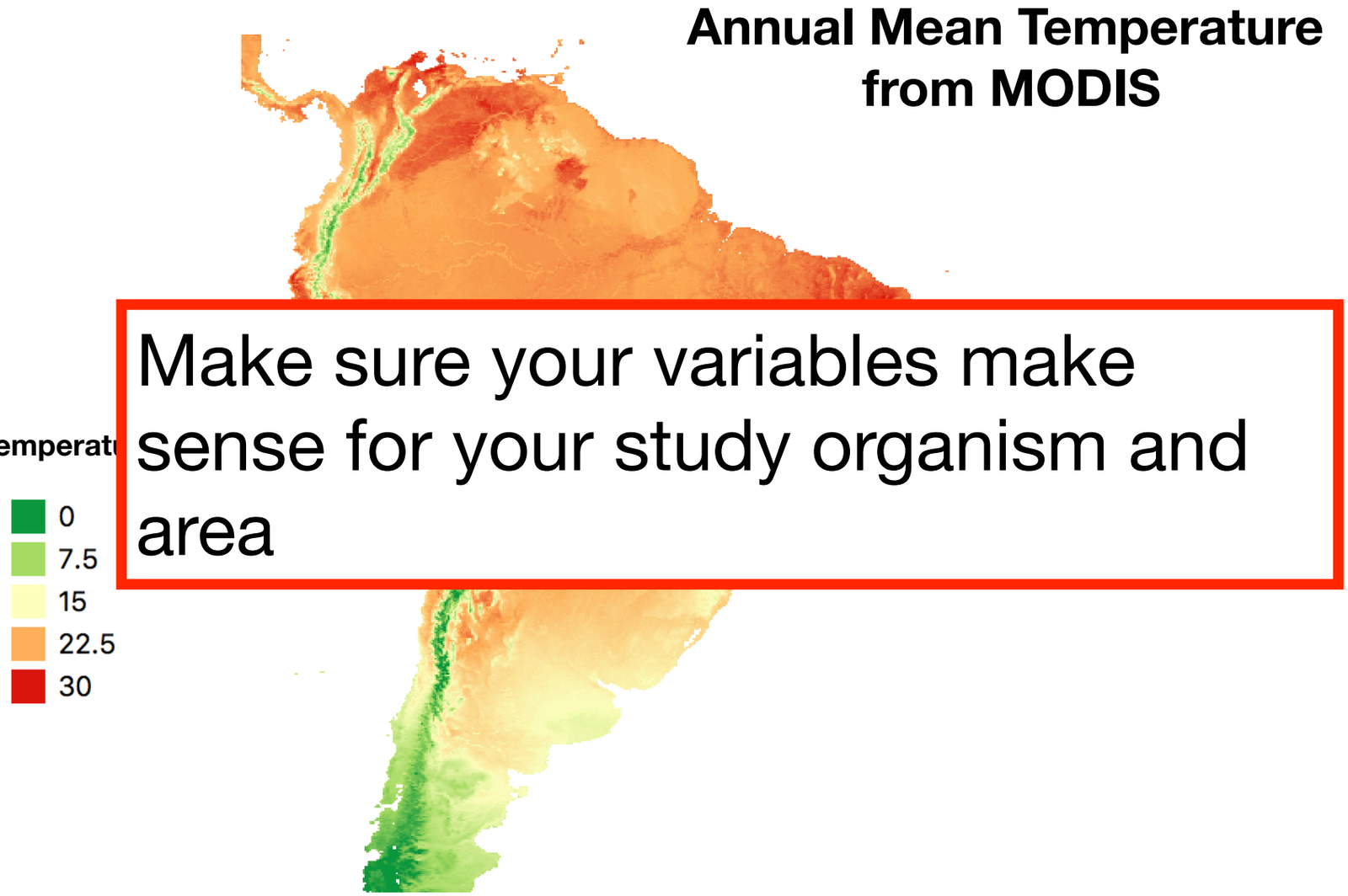
Annual Mean Temperature from Worldclim



Are they the same?



Are they the same?



Make sure your variables make sense for your study organism and area

Explore environmental data

What about time projections?

- To be able to project in time you have to use equivalent layers for model building and projection
- Past and future projections are available for the bioclimatic variables in both Worldclim and Chelsa portals

Georeferenced presence data

- Your own collections
- Primary literature
- Museums
- GBIF, VertNet etc.

Is data always ready?

Is data always ready?

- Can lack coordinates but have locality description

- Can have errors (e.g. wrongly assigned coordinates)

One example

A South American tree frog

Hypsiboas crepitans

DOWNLOAD | 25 OCTOBER 2018

3,361 occurrences downloaded

40% with coordinates

Checking data before modeling