German Centre for
Integrative Biodiversity Research (iDiv)
Halle-Jena-Leipzig

sPlot –the Global Vegetation-Plot Database

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& the sPlot Consortium

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Vegetation plots (relevés)

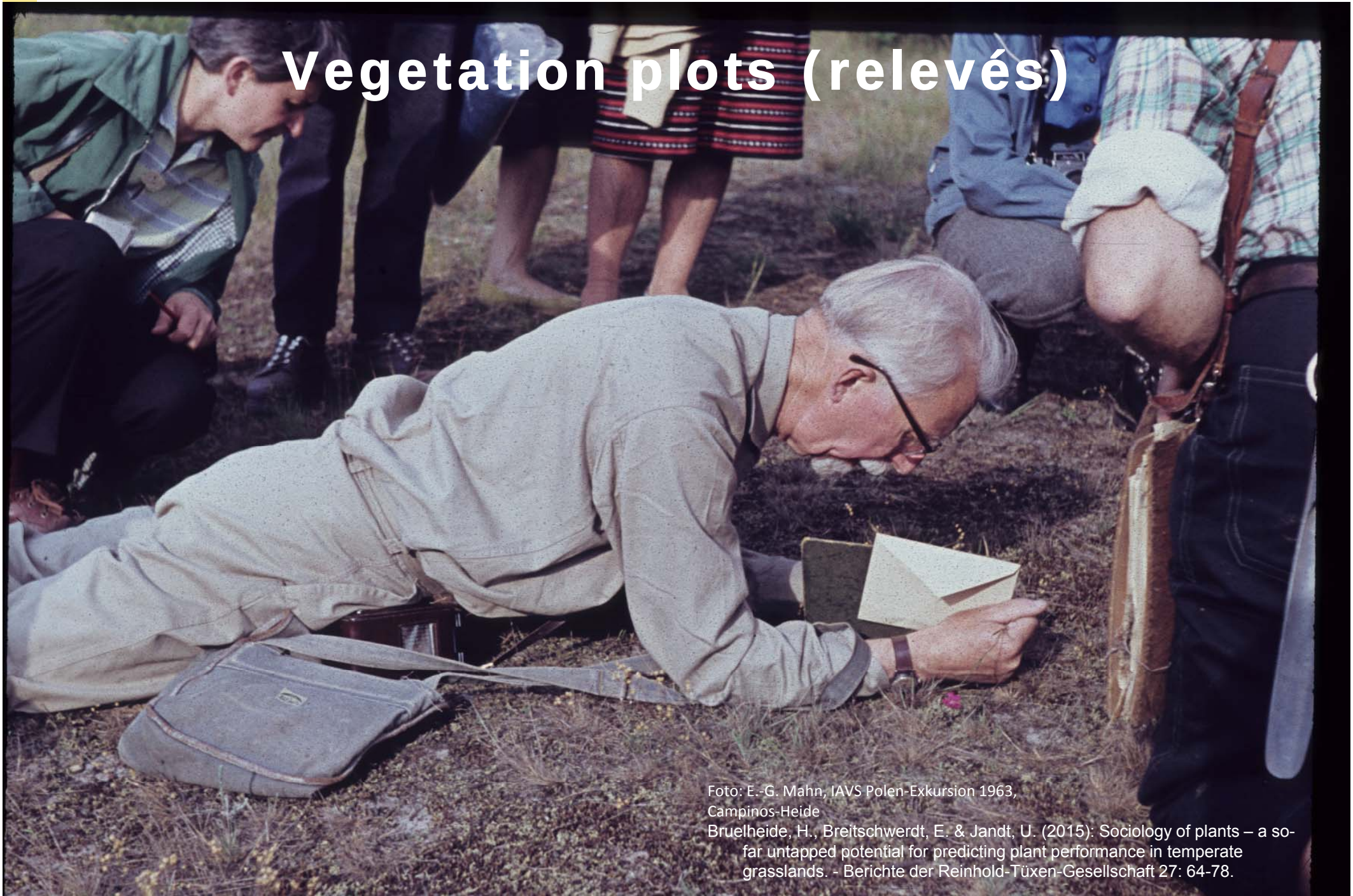

Foto: E.-G. Mahn, IAVS Polen-Exkursion 1963, Campinos-Heide

Bruelheide, H., Breitschwerdt, E. & Jandt, U. (2015): Sociology of plants – a so-far untapped potential for predicting plant performance in temperate grasslands. - Berichte der Reinhold-Tüxen-Gesellschaft 27: 64-78.

Information content of relevés

- **Occurrence**- information
  -> species distribution (SDMs)
- **Biodiversity** information
  -> richness per unit area, α diversity
- **Abundance** information
  -> weighting species for ecosystem functioning
    -> community weighted mean of trait values (CWM)
    -> functional diversity (FD)
  -> community trait – environment relationships
- **Co-occurrence** information
  -> species interactions

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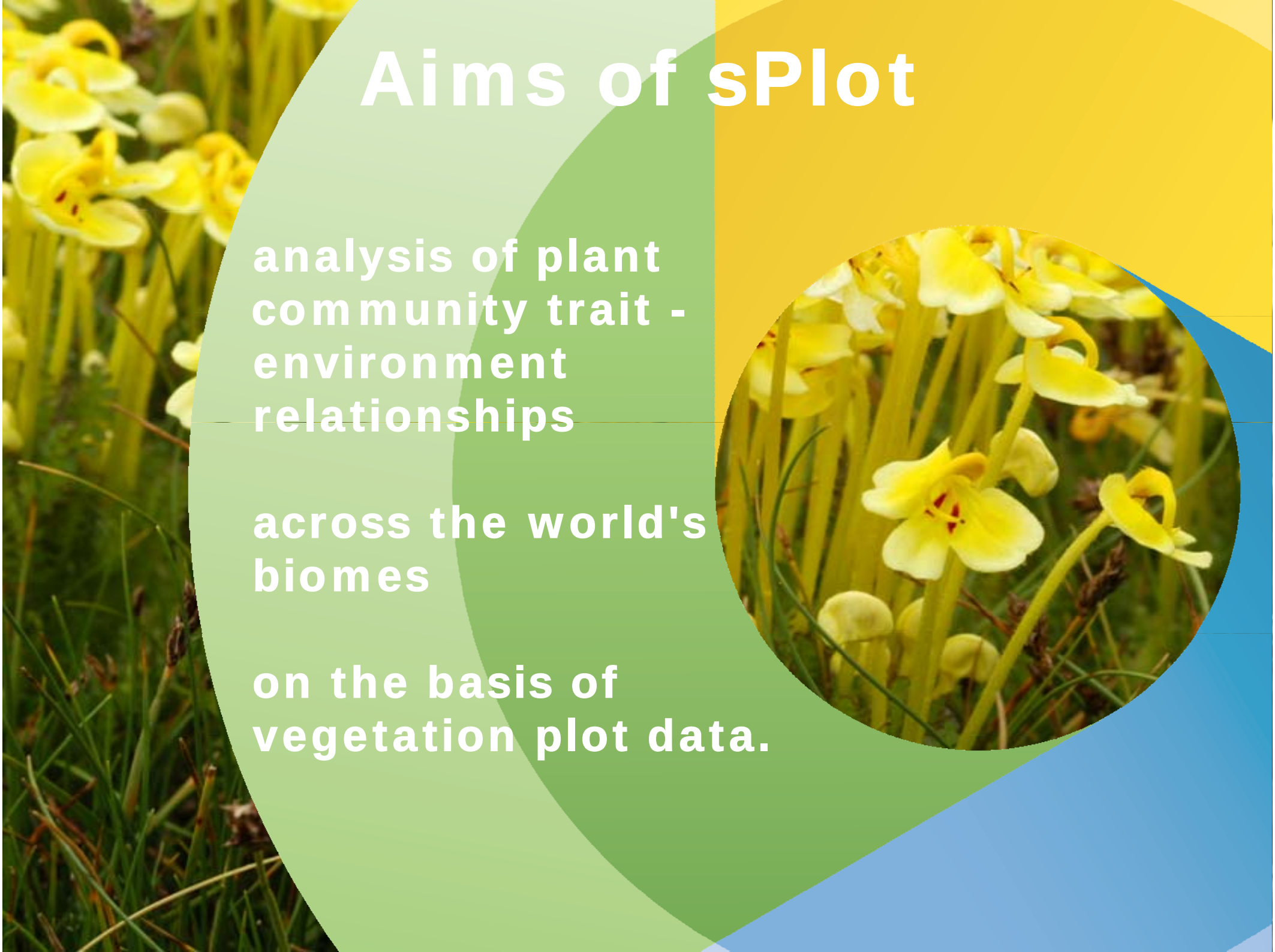
Aims of sPlot



analysis of plant community trait - environment relationships

across the world's biomes

on the basis of vegetation plot data.

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sPlot consortium

Team of experts in:

- Data analysis and synthesis
- Theory
- Vegetation plot/trait databases

sPlot Consortium members (**191**, as of 01 December 2015):

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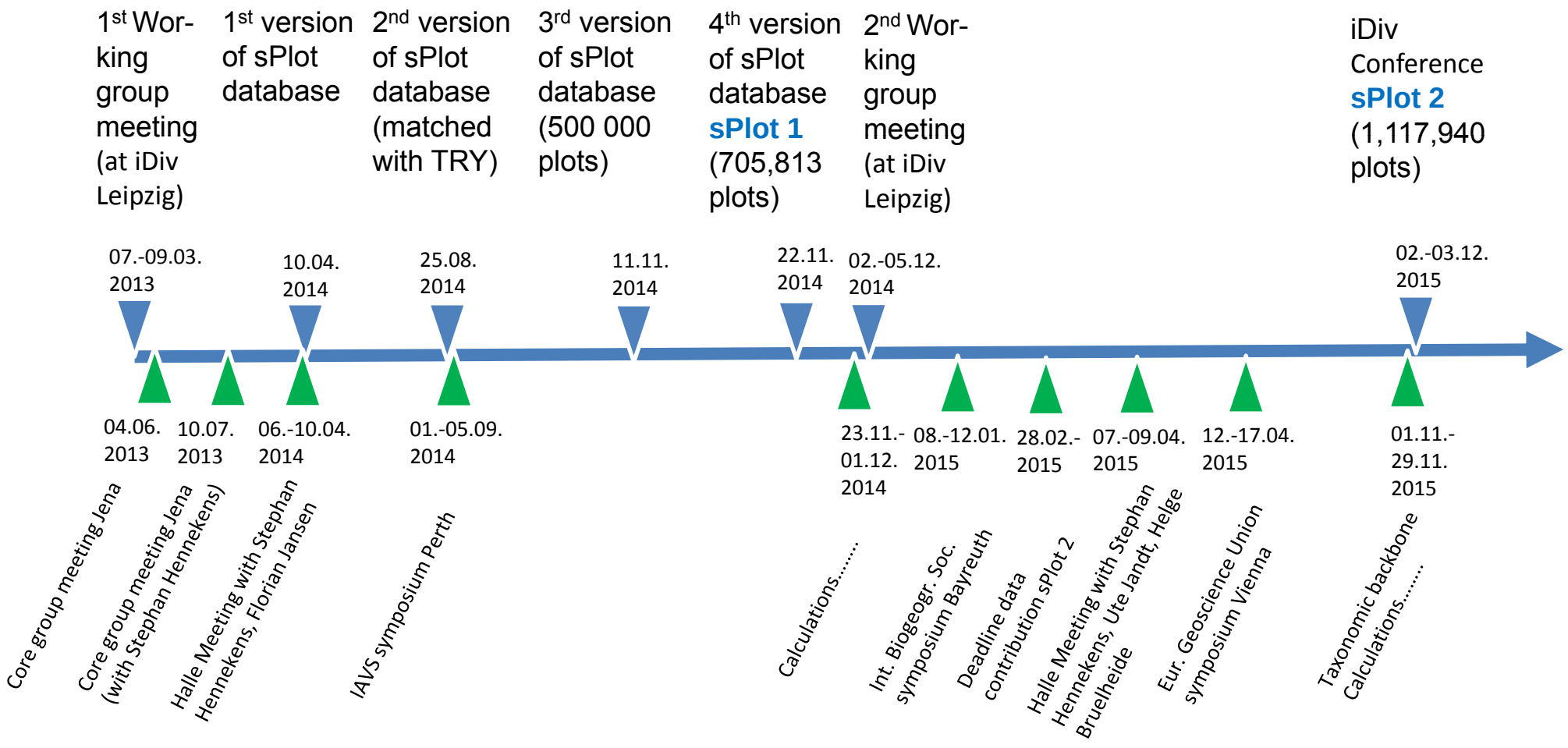
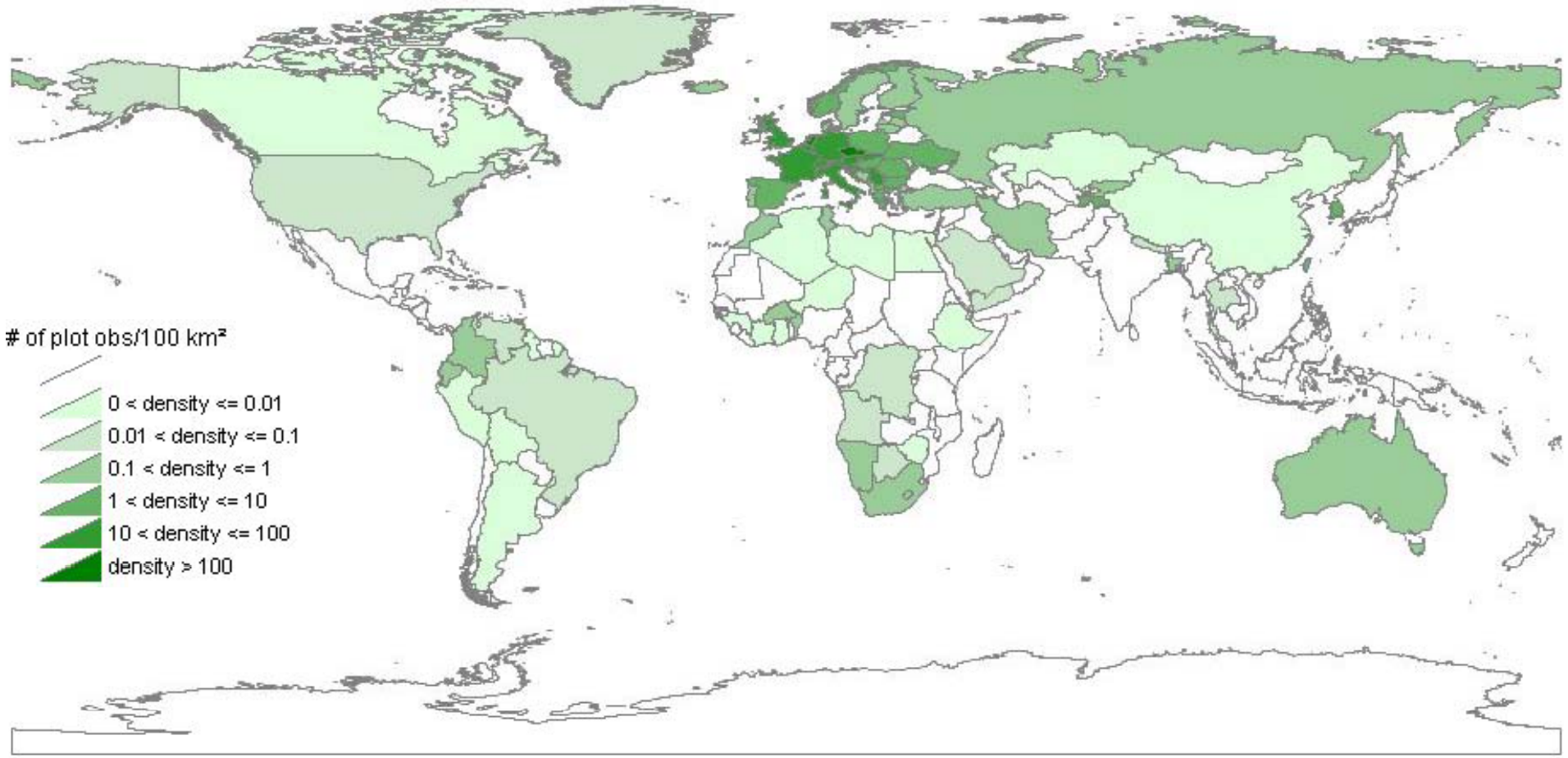
sPlot Timeline

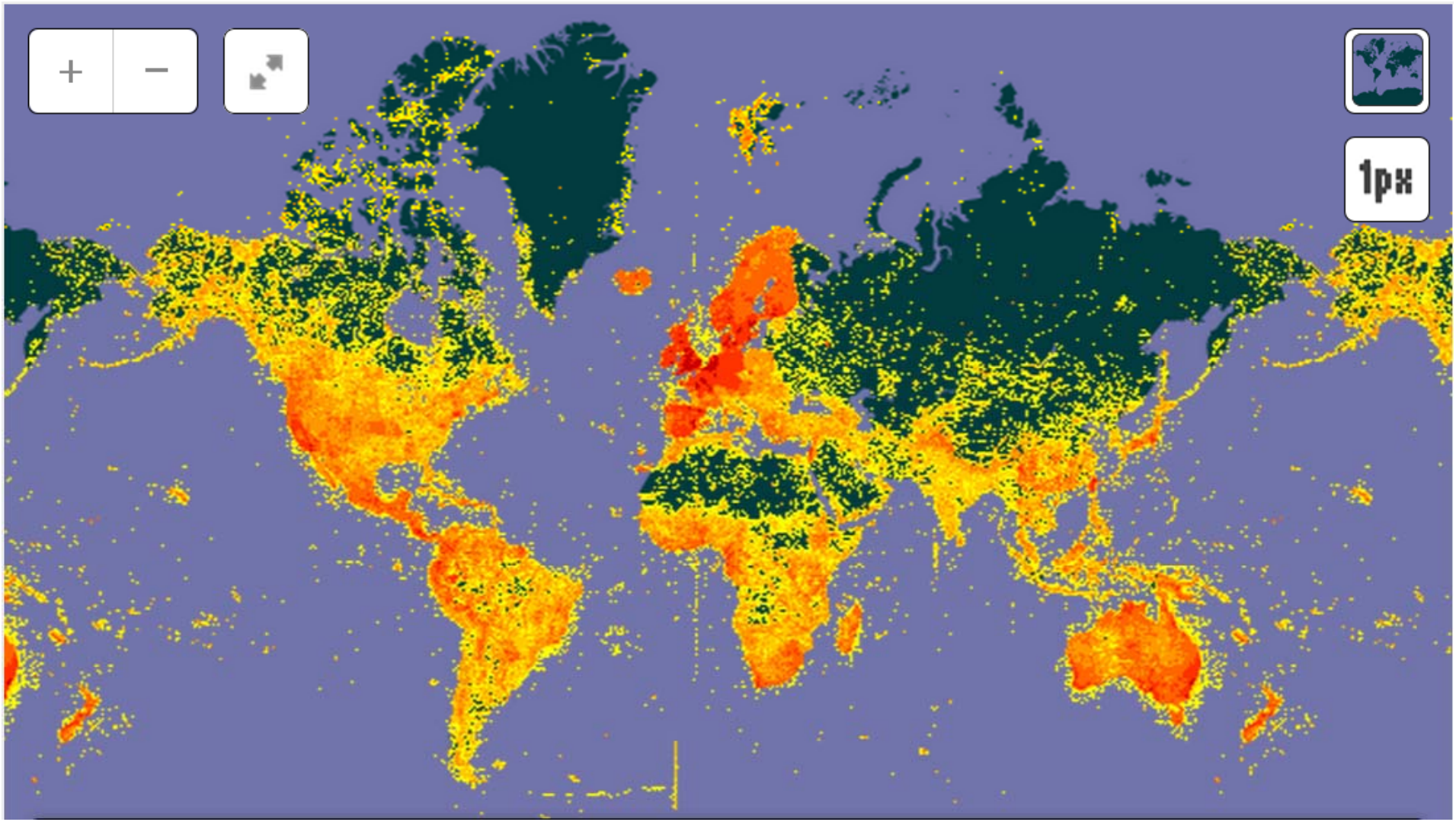


2nd working group meeting Dec. 2014

sPlot 2 Global coverage
1,117,940 plots

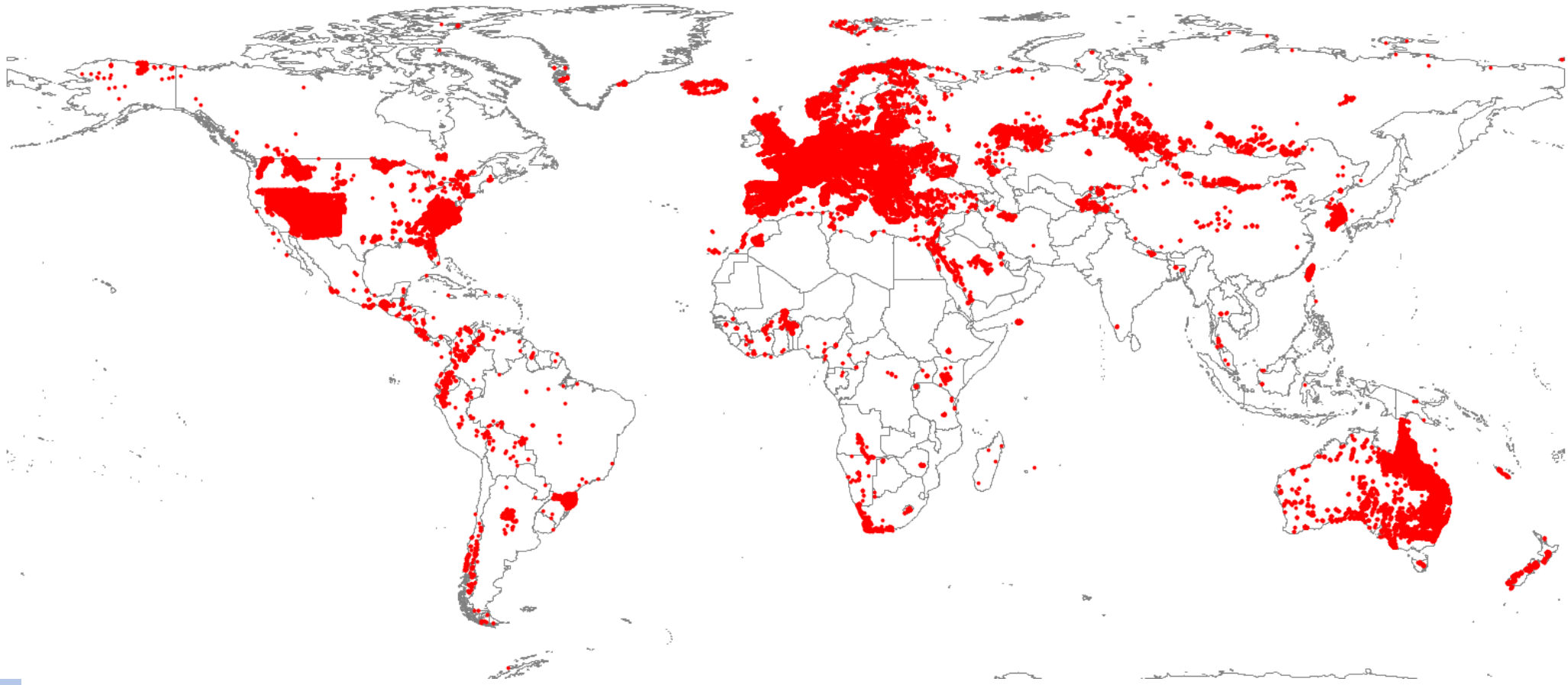


GBIF 127,398,958 records of Higher Plants

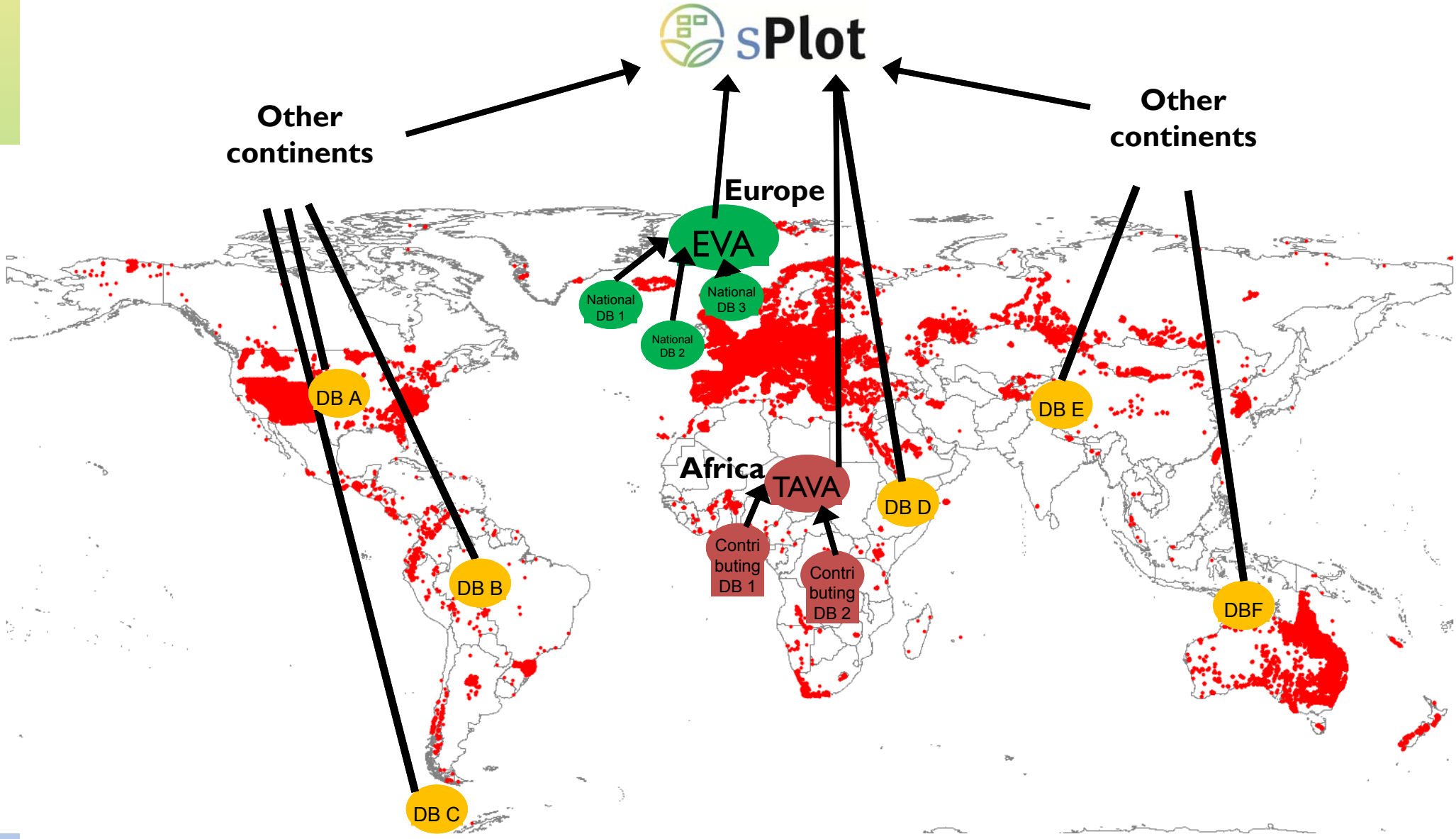


http://www.gbif.org/, accessed 04.05.2015, search terms: "Magnoliophyta", "Pinophyta", "Ginkgophyta", "Equisetophyta", "Lycopodiophyta"

sPlot 2
24,235,008 records (=19% of GBIF)



sPlot 2 data integration



The taxonomic backbone

Turboveg 3

- Import of all data sources in Turboveg 2 format
- Collation of all single source Turboveg 2 databases in Turboveg 3
- Multiple taxonomies (taxon matching)
- Management of meta-data (data owners, etc.)

sPlot & TRY backbone comprises **122,901** (partly non-standardized) names in sPlot 2.0 and TRY 3.0

- 62,628 unresolved names were unique to sPlot, 35,477 unique to TRY and 24,796 shared between TRY and sPlot
- **Accepted names: 95,485**; Synonyms: 20,952; Unresolved: 4,772; No suitable matches found (even after manual search): 1,692
- Taxonomic ranks: species-level: 105,818; genus-level: 13,383; family-level: 1,880
- 90,696 standardized unique names (sPlot & TRY combined) belonging to 665 families, **60,908 names in sPlot 2**

Traits from TRY 3.0

Gap-filled data through matrix factorization

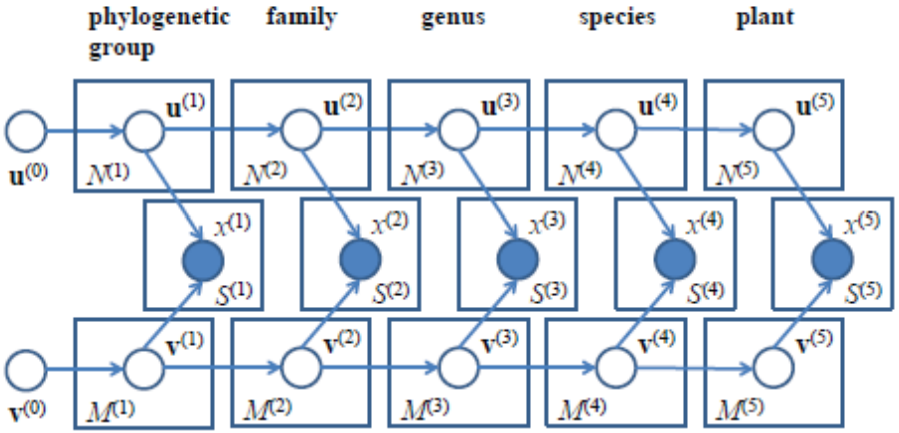


Fig. 1 from Shan, H. et al. (2012): Gap Filling in the Plant Kingdom—Trait Prediction Using Hierarchical Probabilistic Matrix FactorizationProceedings of the 29 th International Conference on Machine Learning, Edinburgh, Scotland,

Total number of species with gap-filled species in TRY: **40,790**

Of these are in sPlot **36,832** (**60.47 % of all species in sPlot 2**)

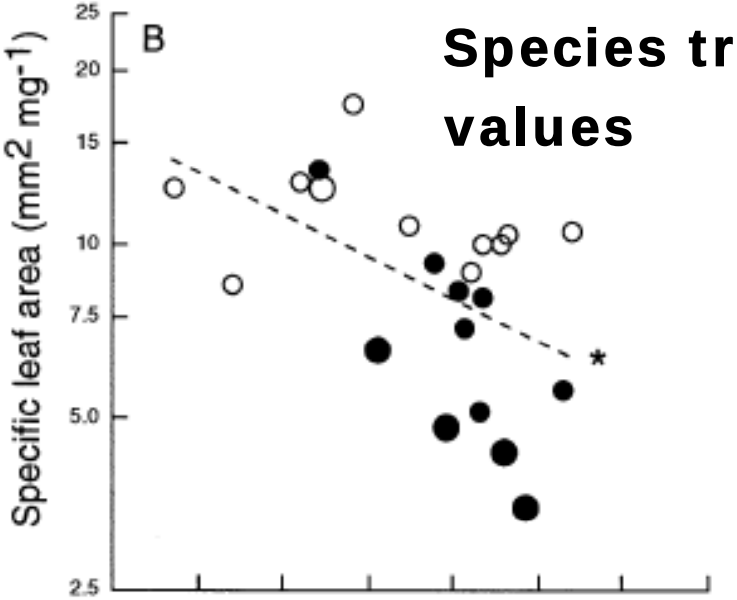
18 Traits: SLA, PlantHeight, SeedMass, LDMC, StemDens, LeafArea, LeafN, LeafP, LeafNperArea, Leaffreshmass, LeafNPratio, LeafC.perdrymass, Leaf.delta.15N, Stem.cond.dens, Seed.num.rep.unit, Wood.vessel.length, Seed.length, Disp.unit.leng,

Species trait values versus community weighted mean (CWM)trait values

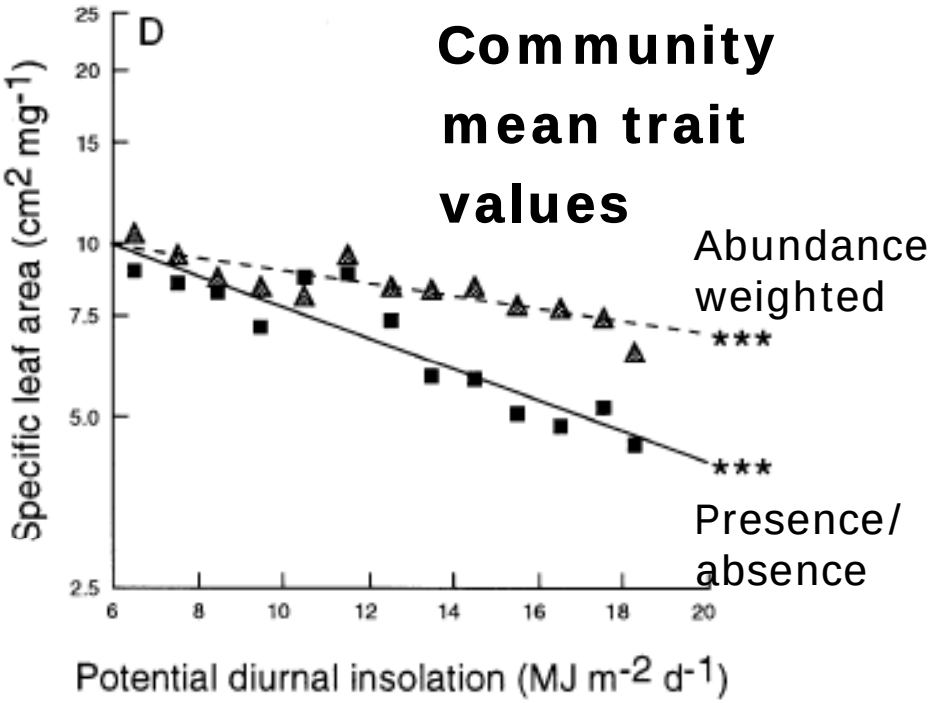
- Species traits value plotted against (unweighted) **mean** site variables

Or

- Community **mean** trait values plotted against (weighted or unweighted) site variables



Species trait values



Community mean trait values

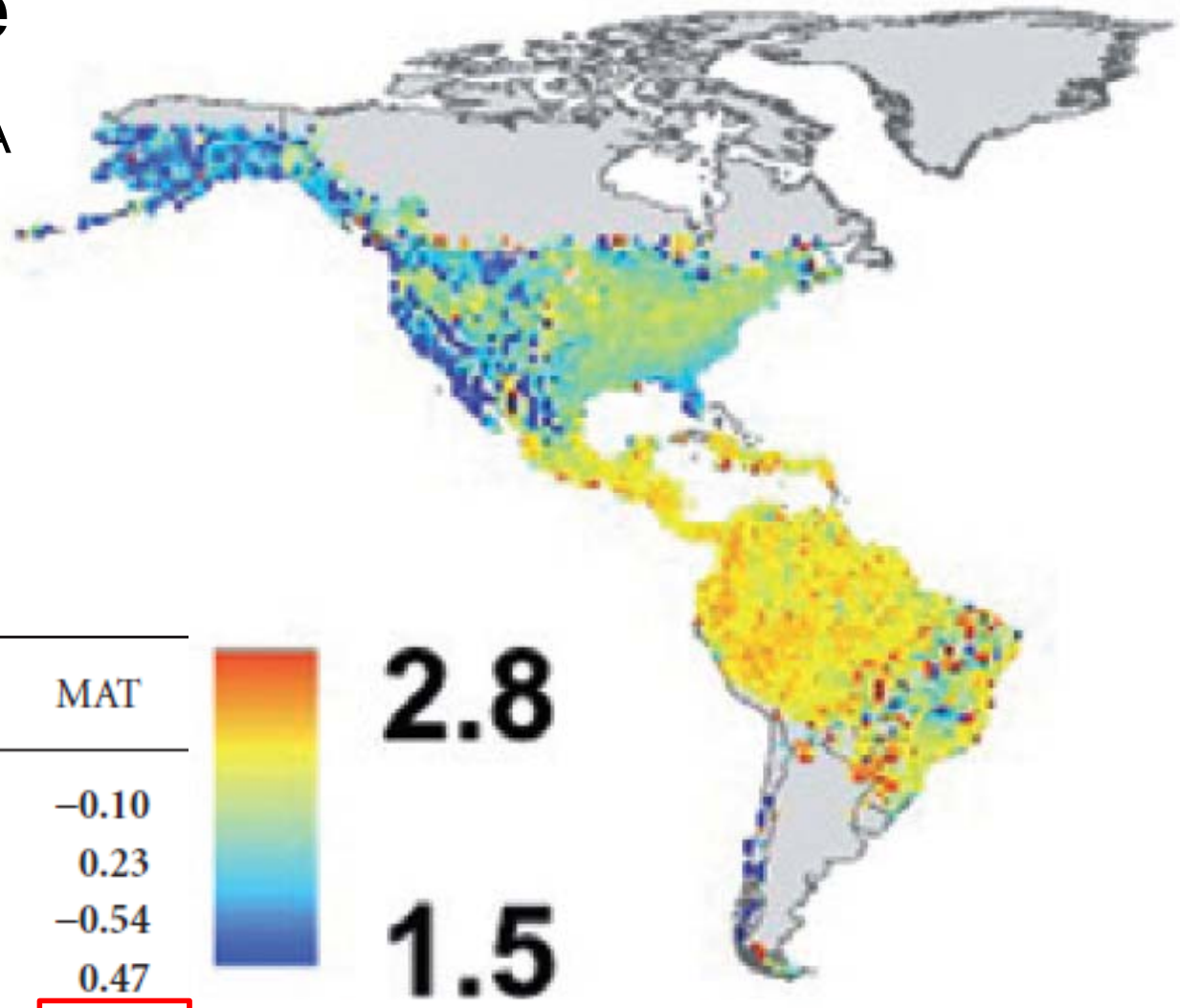
Abundance weighted

Presence/ absence

Fig. 4B, D from Ackerly et al. 2002, Oecologia 130: 449-457.

Species trait values (SLA) as a function of macroclimate

- Latitudinal gradient in SLA (log_{10} transformed)
- Based on species occurrence data on 1° grid cells.

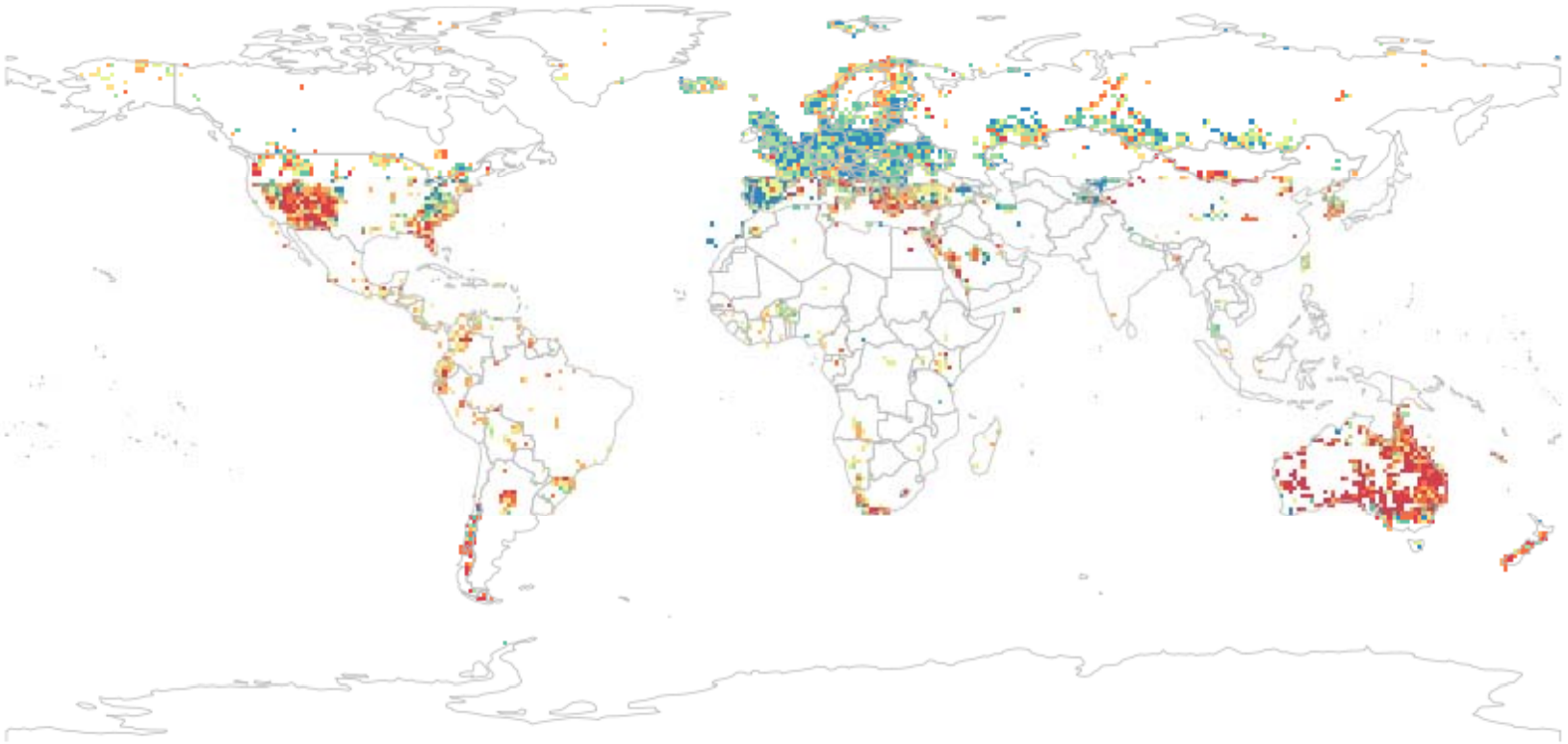


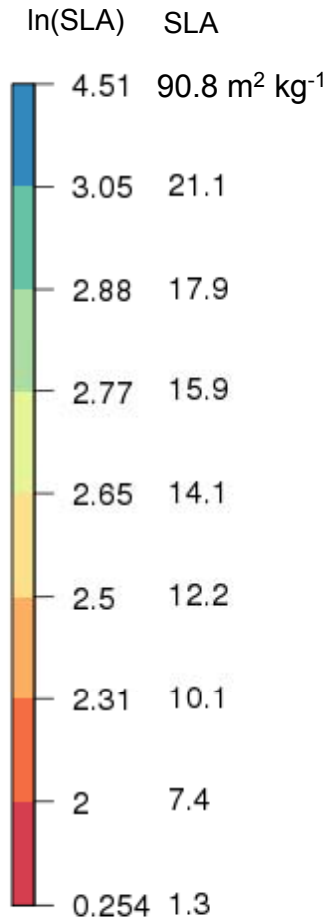
Trait	Lat	Alt	MAT
Maximum height	**0.25**	**−0.05**	**−0.10**
Leaf %N	**−0.01**	**0.18**	**0.23**
Leaf %P	**0.62**	**0.07**	**−0.54**
Seed mass	**−0.26**	**−0.20**	**0.47**
Specific leaf area	**−0.48**	**−0.19**	**0.33**
Wood density	**−0.61**	**−0.24**	**0.62**

Fig. 1 and Table 1 from Swenson et al. 2012, Global Ecol. Biogeogr. 21: 798-808.

Community weighted mean trait values (CWM SLA) as a function of macroclimate

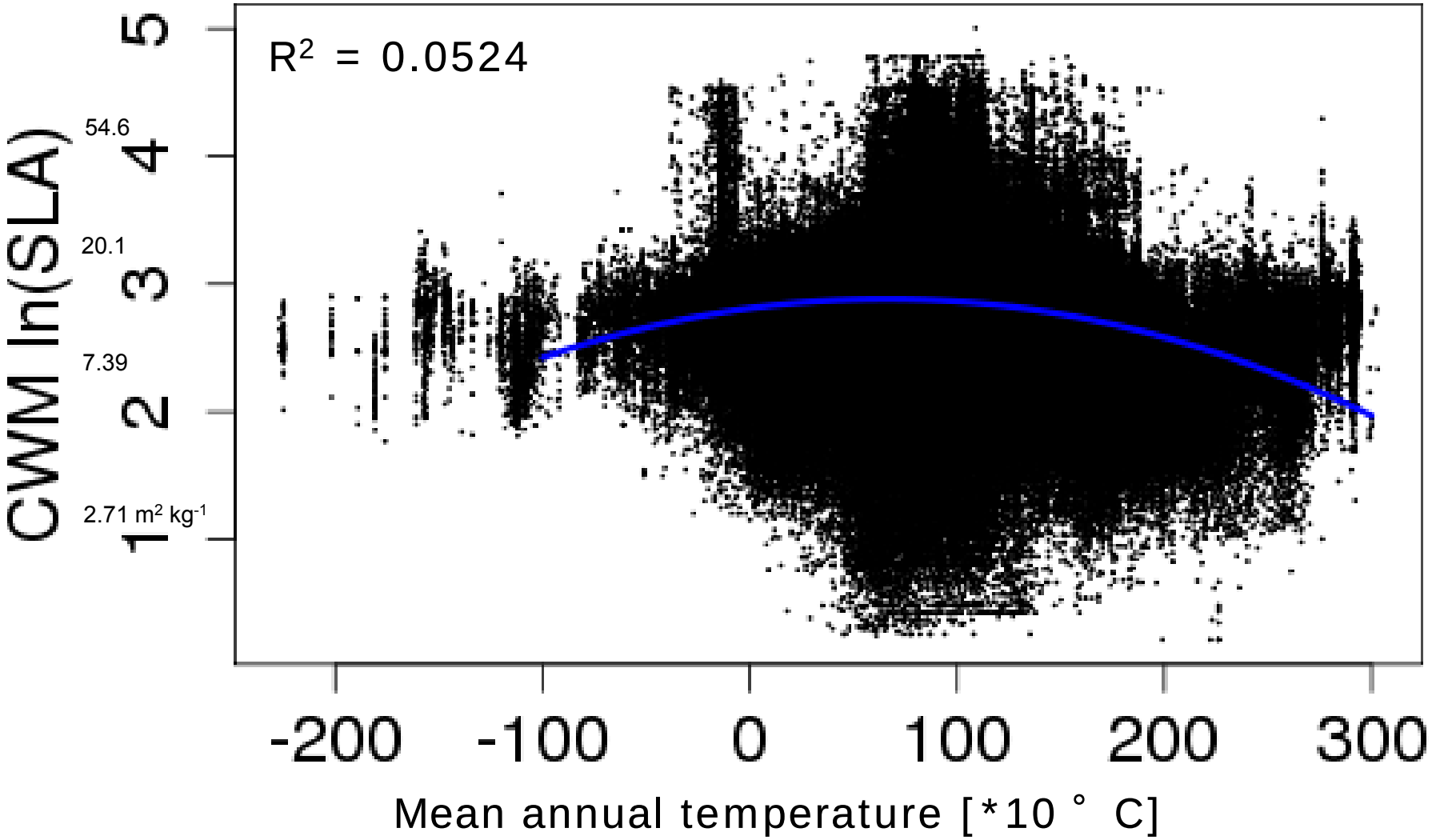
- Based on 1,111,401 plots (99.41% of all plots)
- SLA (log_e transformed)





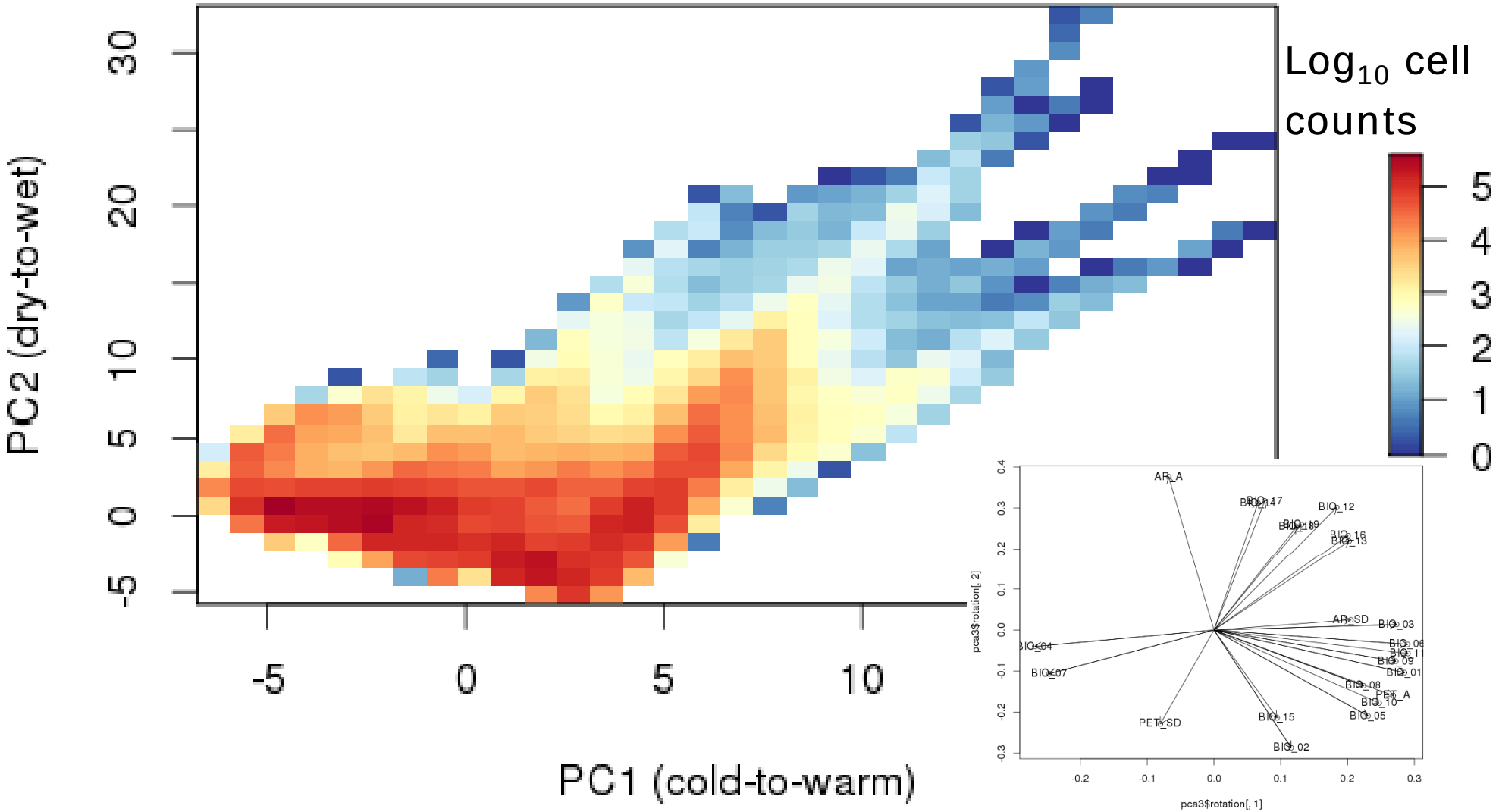
CWM SLA ~ MAT

- Based on 1,111,401 plots (99.41% of all plots)



Worldwide pattern of temperature and precipitation

- Based on 9,033,453 raster cells à 2.5 arc min in Bioclim



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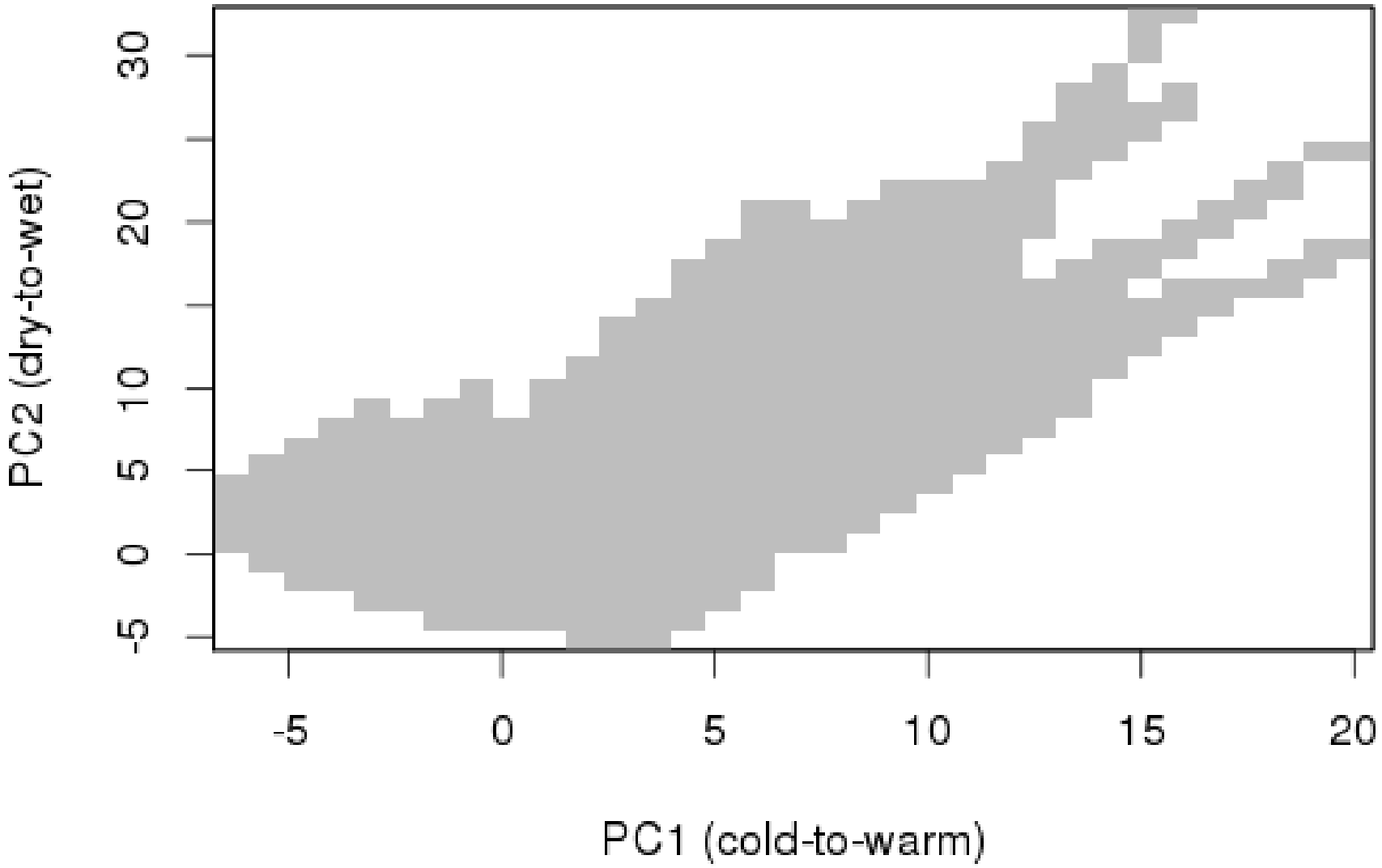
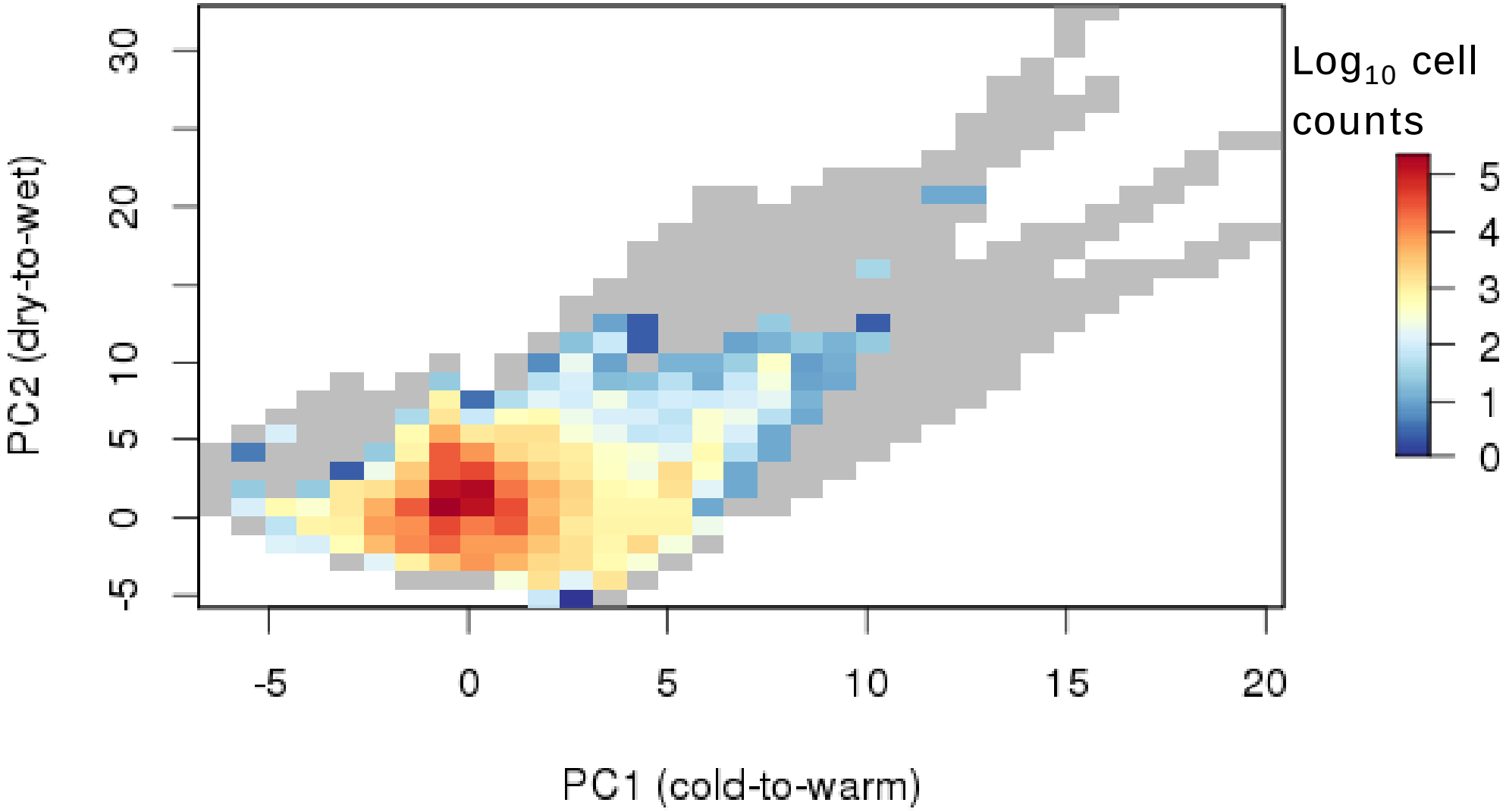


Plots with CWM traits in temperature and precipitation space

- Based on 1,111,401 plots (99.41% of all plots)



Next steps

Paper projects

1. Database paper
2. Resampling strategy
3. Basic pattern paper, CWM, FD ~ climate, GDD, soil, fire,
4. Climatic variability, including multiple time scale, CWM, FD, PD
5. EF (productivity, ...) ~ CWM, FD, PD
6. Invasive/alien species
7. Link to animal databases
8. Diversity ~ area relationship

sPlot 3.0

- Call in 12 to 18 months
- Focus on large databases in under-represented regions
- Focus on grasslands and forests

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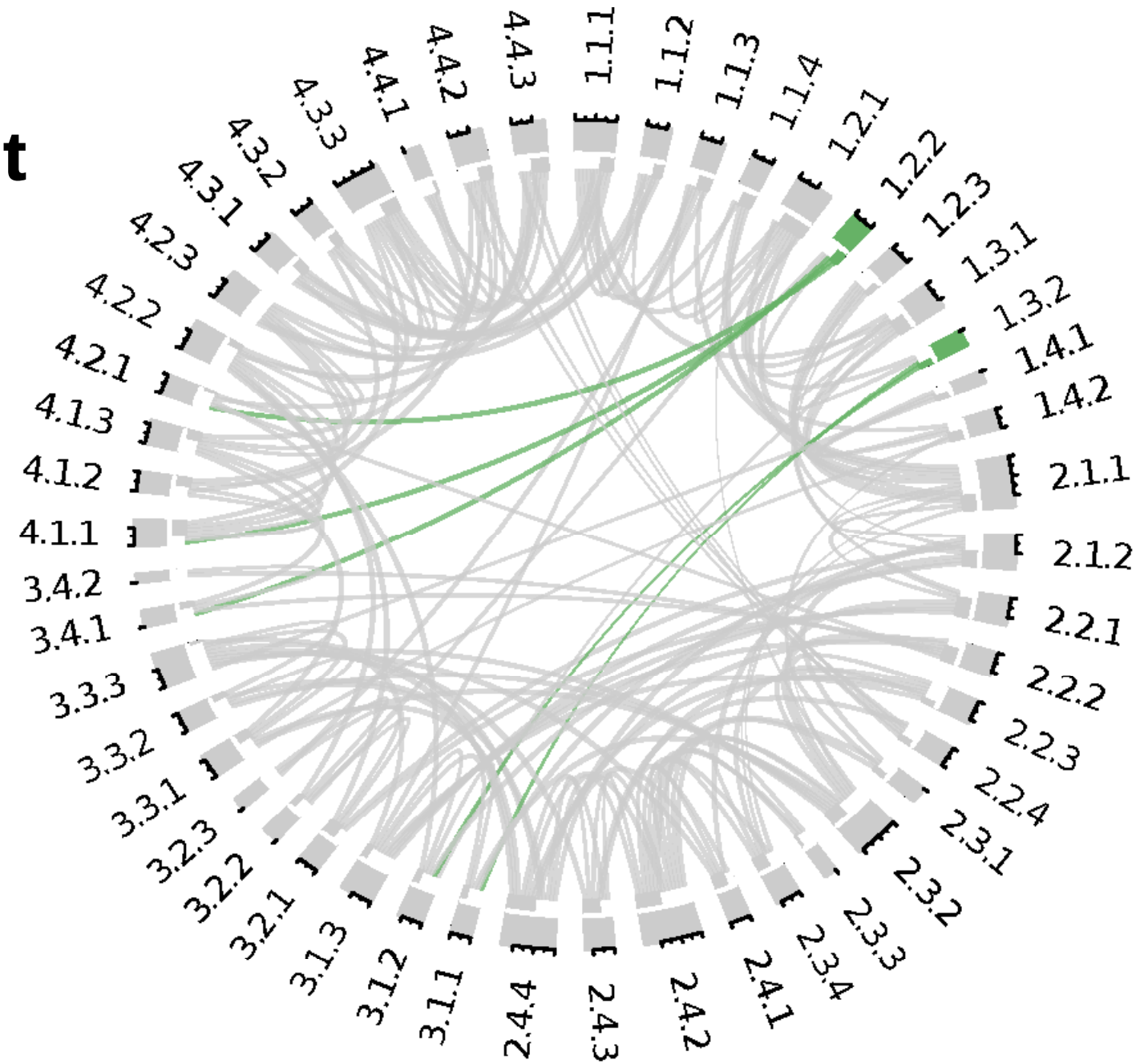
sPlot as a core dataset in iDiv 2.0



Acknowledgements

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