



Food and Agriculture
Organization of the
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10
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2022

Potential distribution of black soils in Mexico

Launch of the
International Research
Institution of Black Soils

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SECRETARÍA DE AGRICULTURA Y DESARROLLO RURAL

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Dirección General de Políticas, Prospección y Cambio Climático

Secretaría de Agricultura y Desarrollo Rural de México

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Increase the quality, quantity and access of black soils information across Mexico

- Build technical and institutional capacities for **black soils** mapping and monitoring
- Updating **black soils** estimates to support national sustainable soil management strategies

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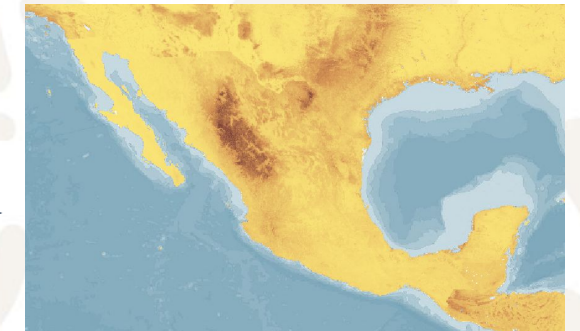
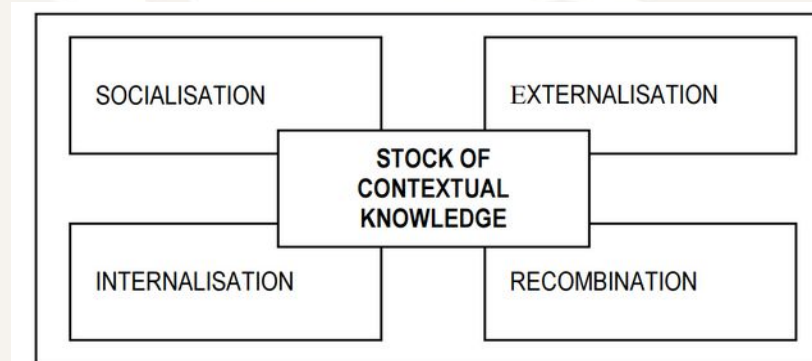
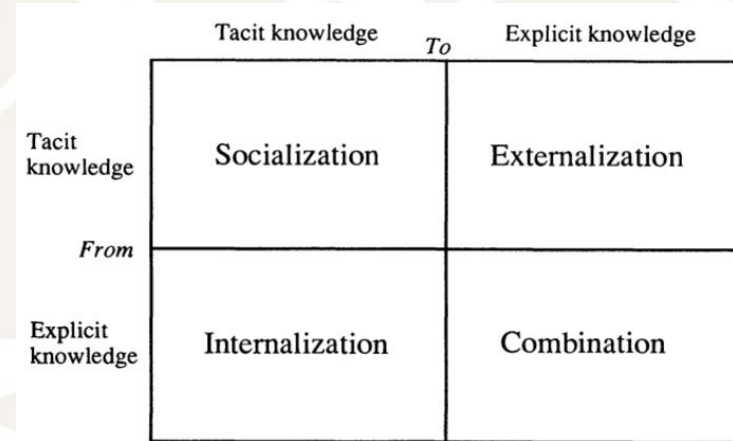


Organizational knowledge creation



Global initiatives
and facilitators (e.g., GSP)

Nonaka, 1994

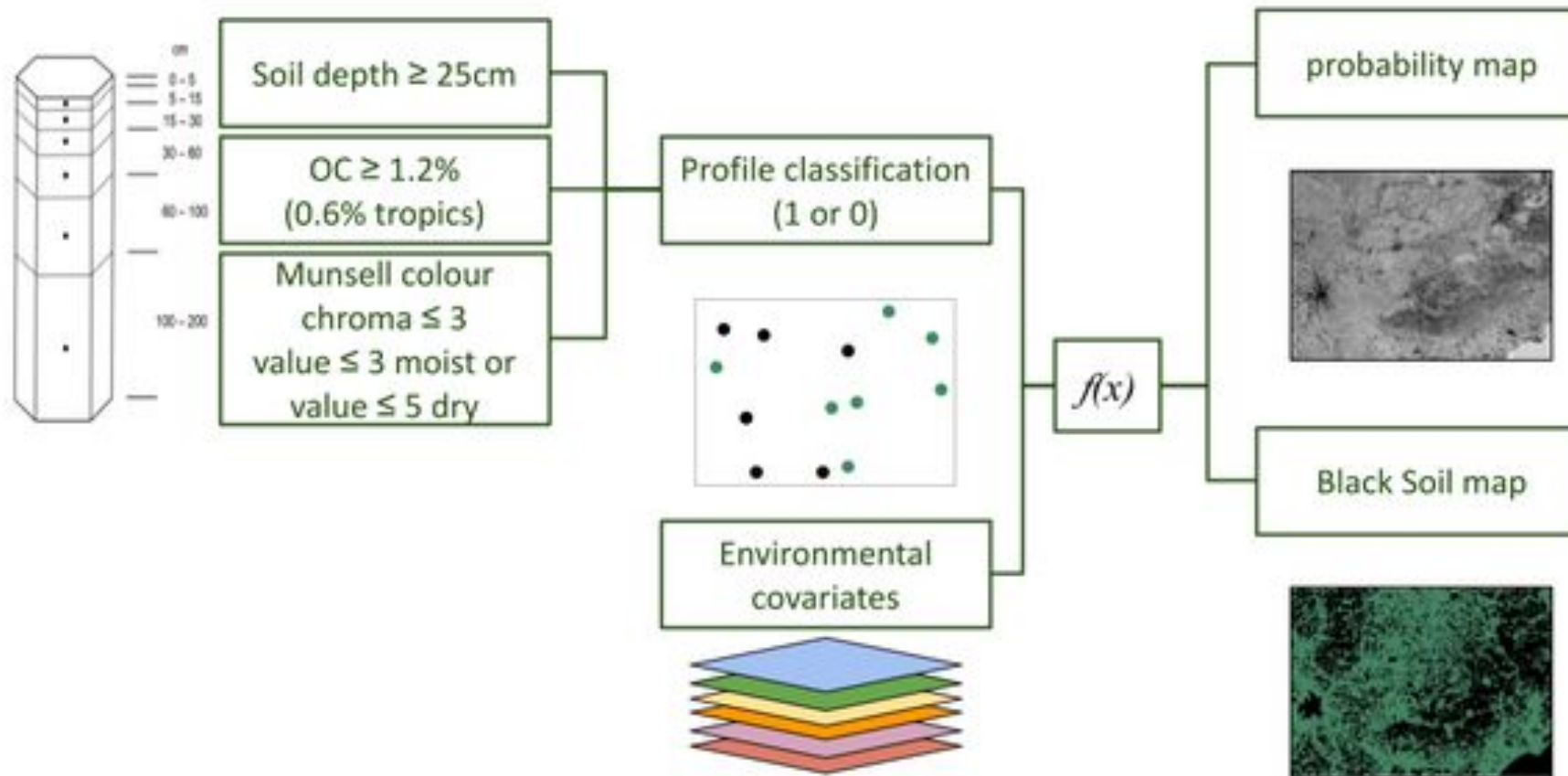


Country specific contributions

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Methodological guidelines (FAO, 2021)



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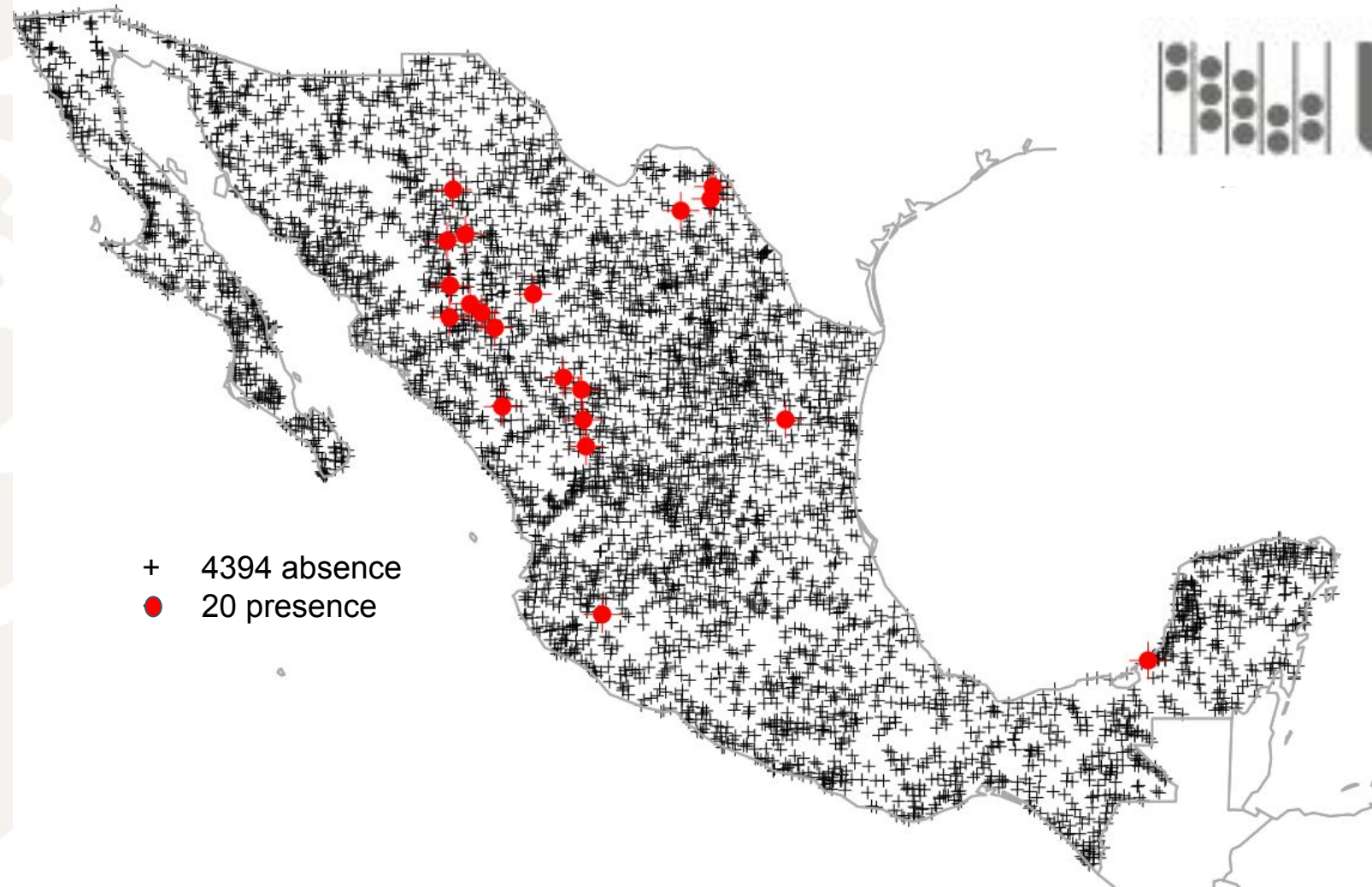
Black soils may be well distributed across a large diversity of environments in Mexico



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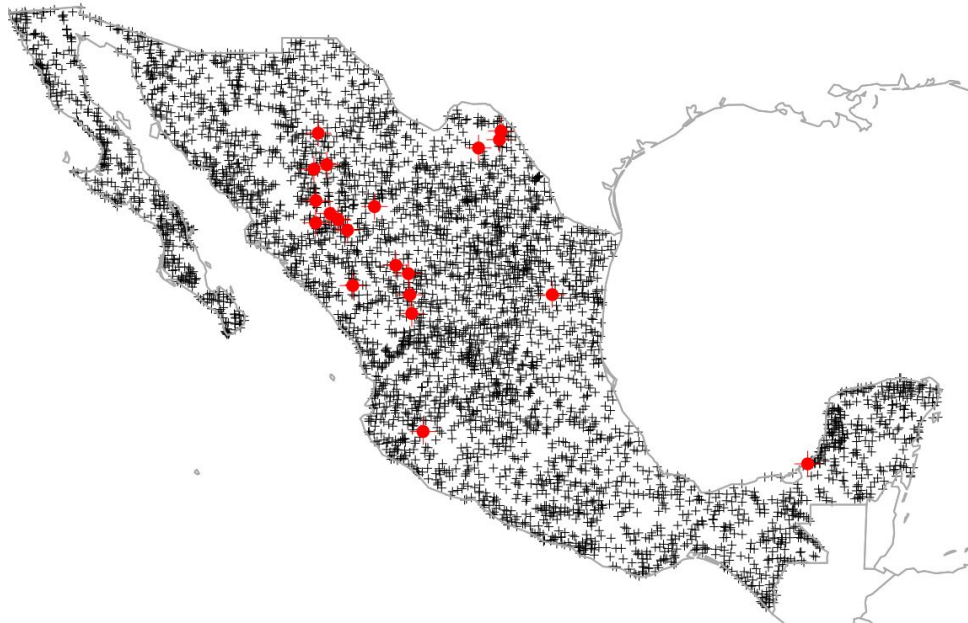
The training dataset (only 20 points meet BS criteria)



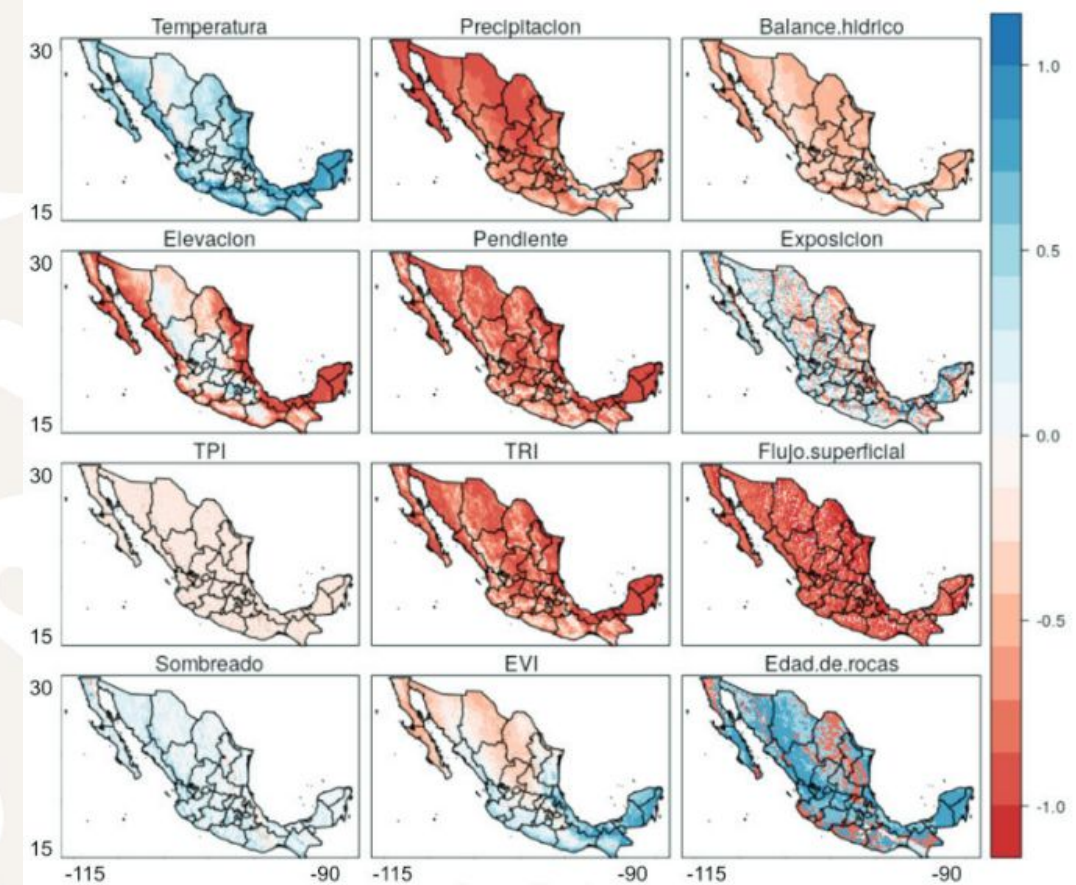
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Working hypothesis



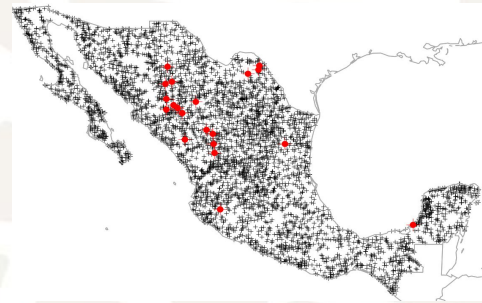
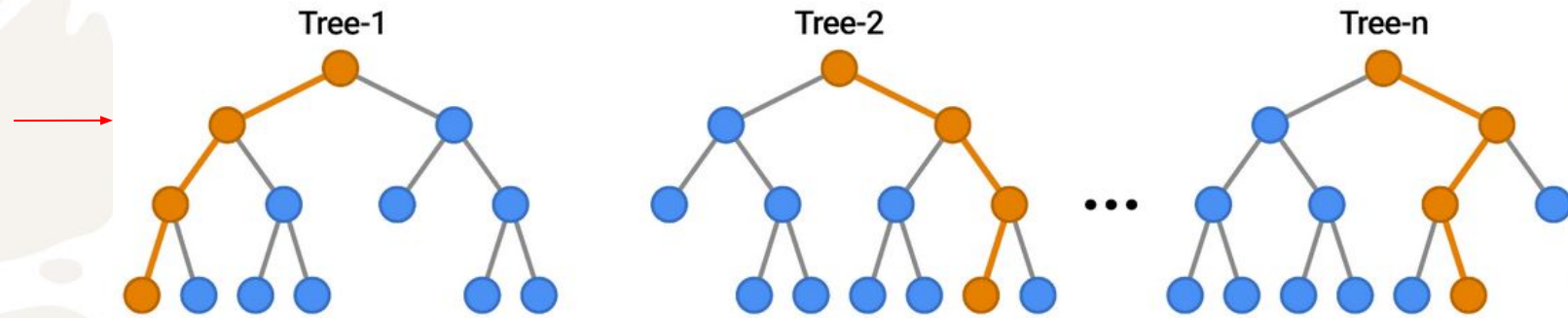
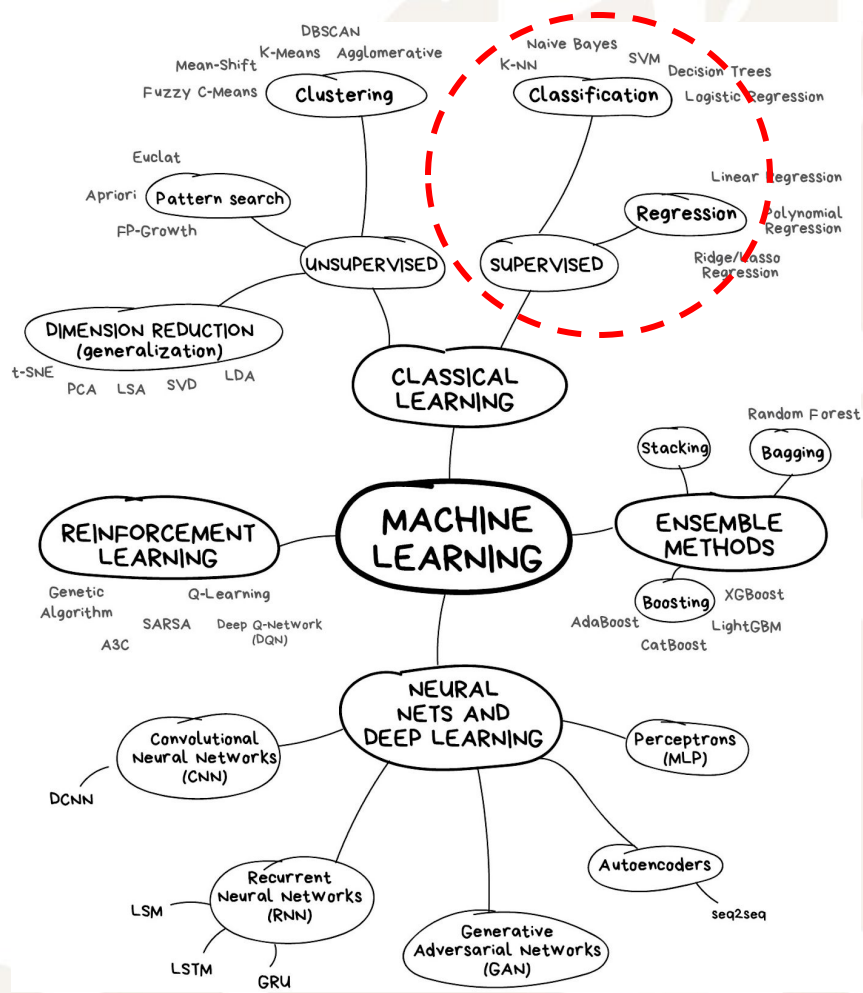
$$f(x)$$



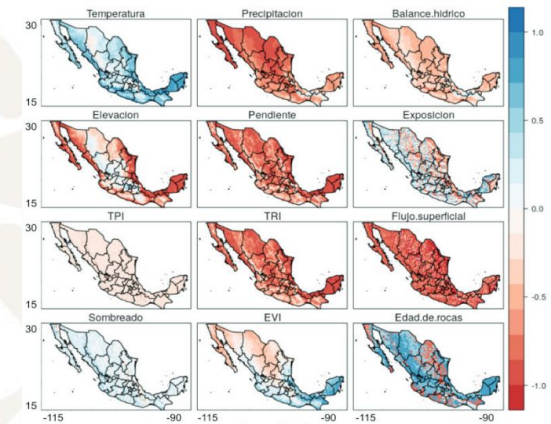
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The quick (and dirty?) Random Forests



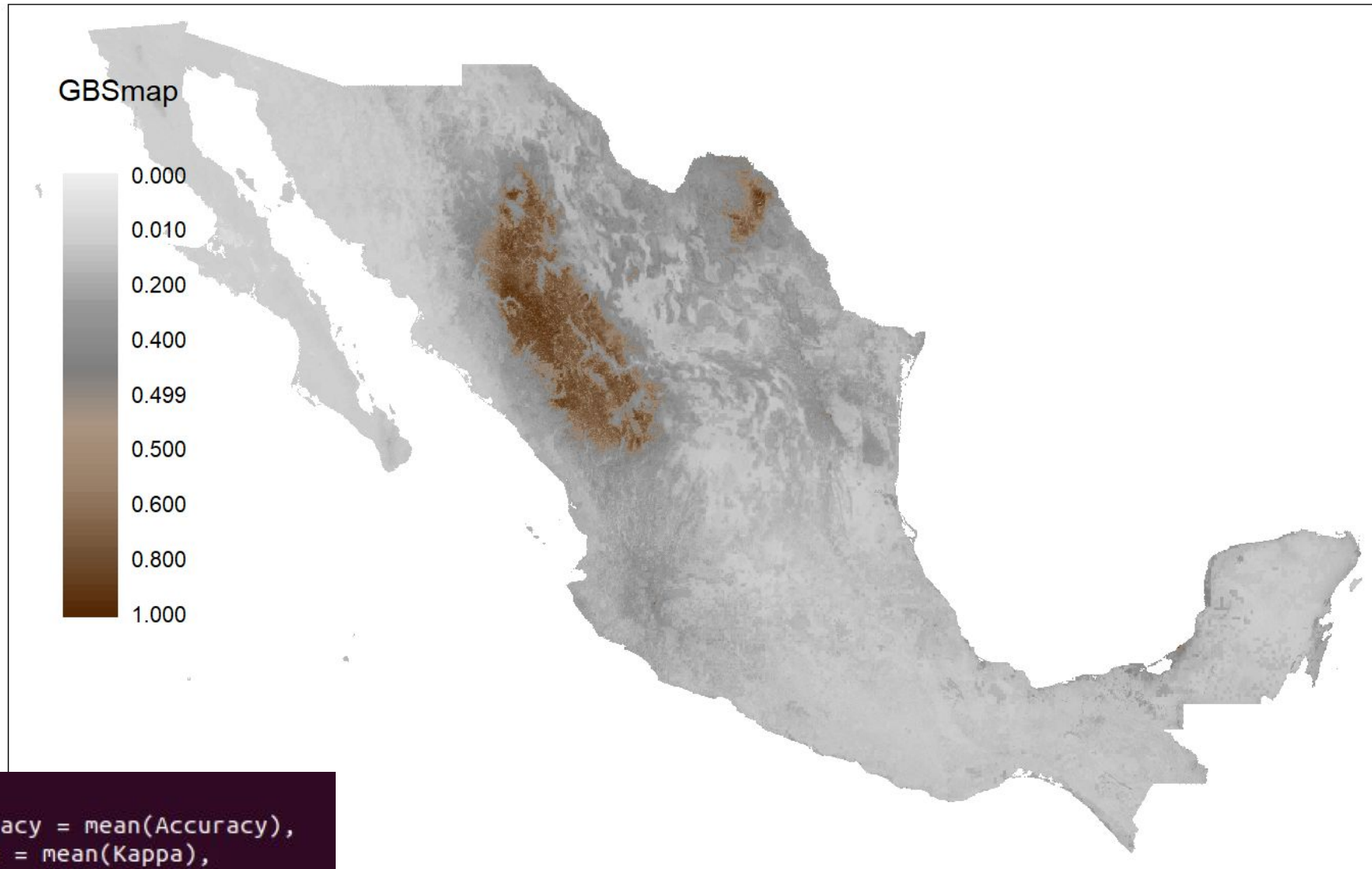
$$f(x)$$



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Prediction of black soils presence

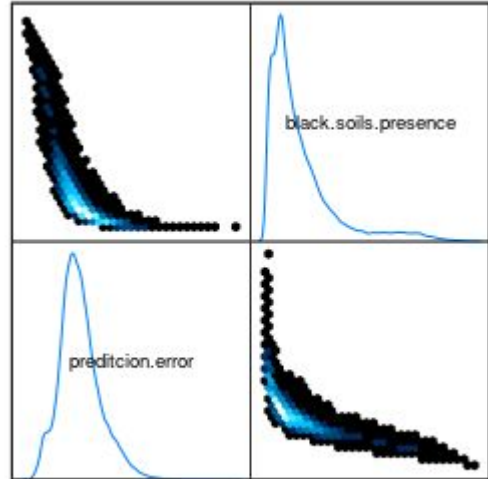


```
accuracy %>%  
summarise(accuracy = mean(Accuracy),  
          kappa = mean(Kappa),  
          sd_acc = sd(Accuracy),  
          sd_k = sd(Kappa))  
accuracy  kappa    sd_acc    sd_k  
0.96875 0.9375 0.03778048 0.07556097
```

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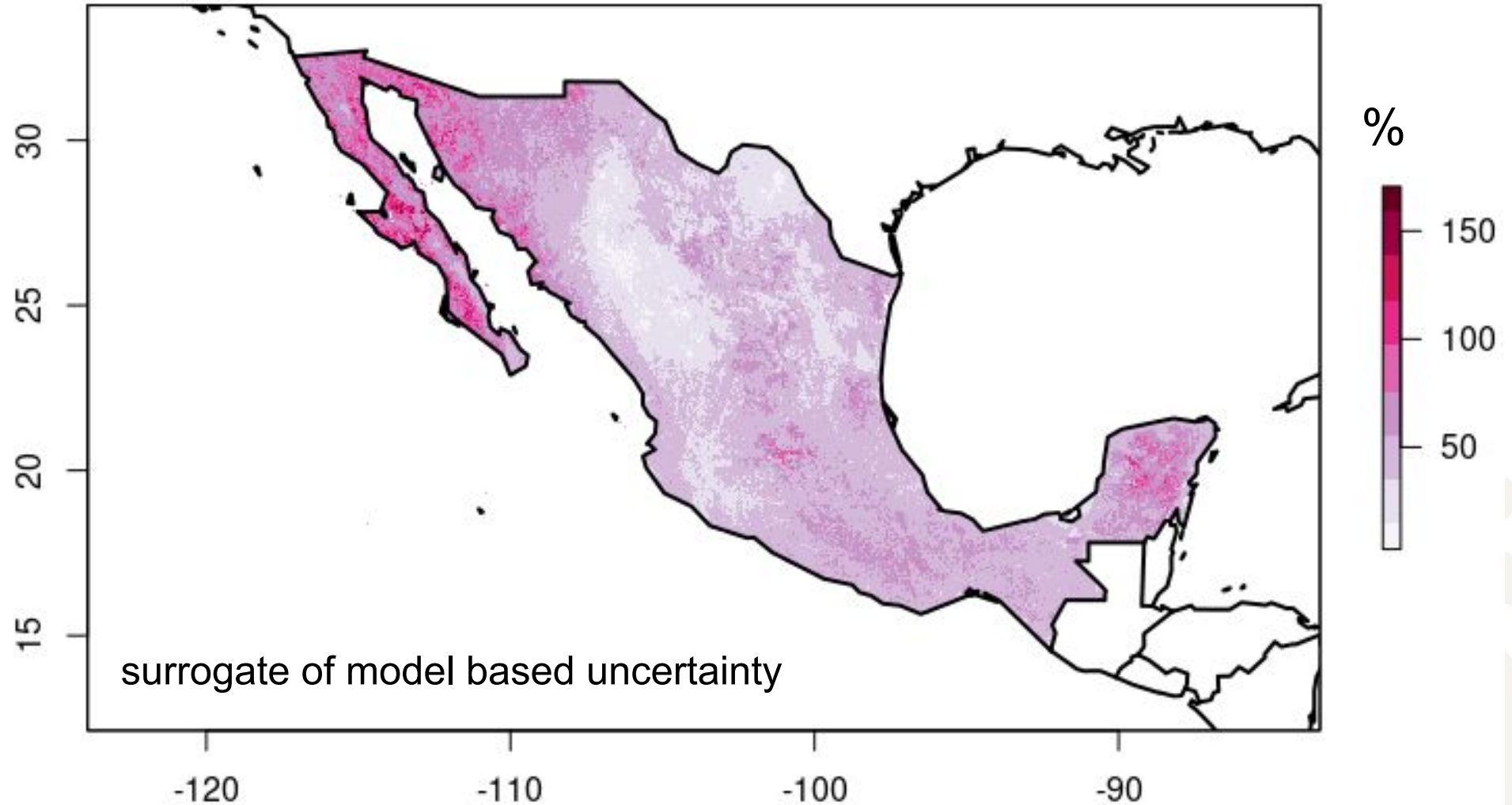
High prediction variance (n=100 model realizations) of black soils presence in V1



Scatter Plot Matrix

$r=0.7$, evidence of potential systematic bias

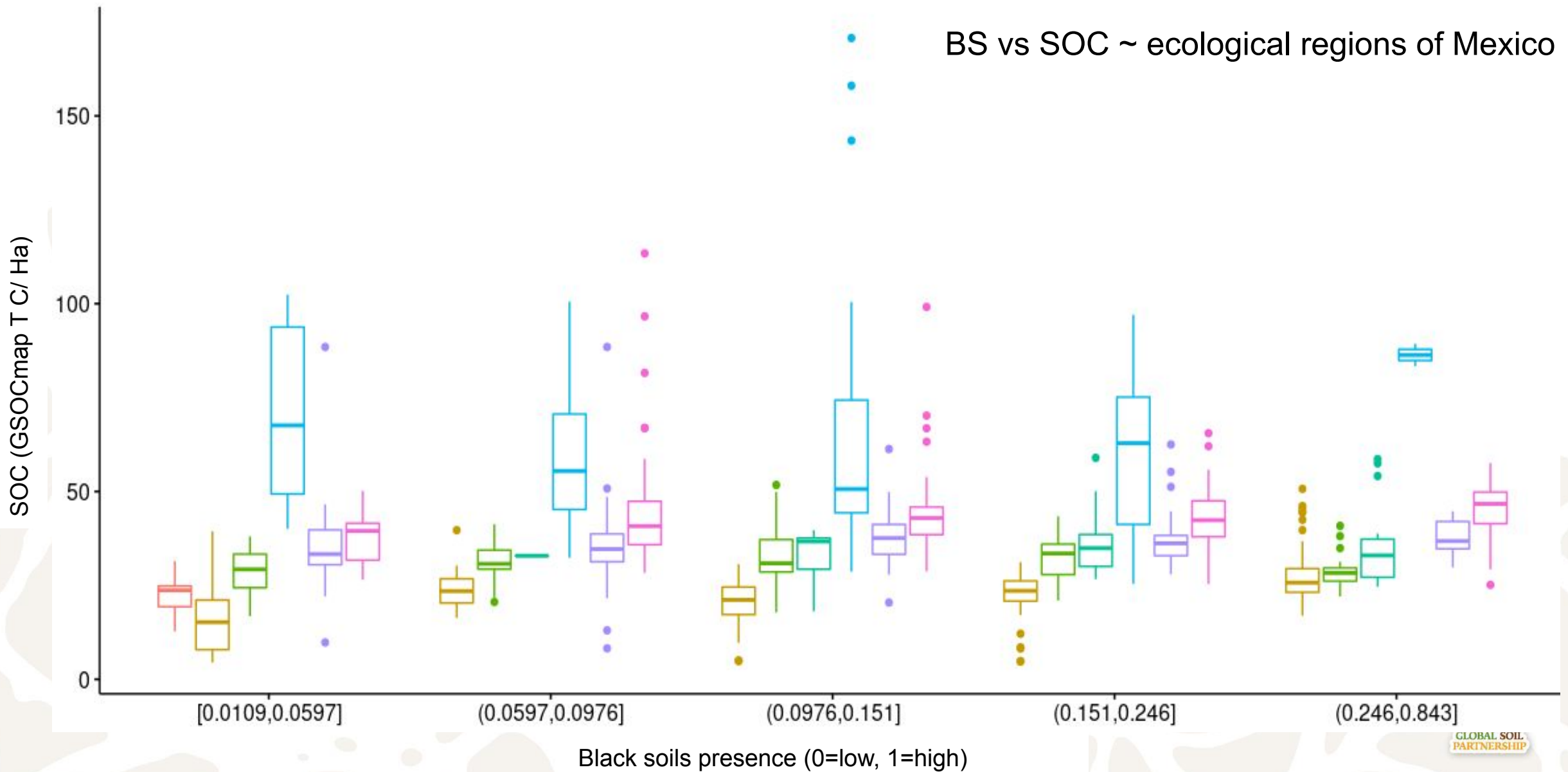
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eco

California Mediterranea	Elevaciones Semiáridas Meridionales	Selvas Calido-Humedas	Sierras Templadas
Desiertos de America del Norte	Grandes Planicies	Selvas Calido-Secas	

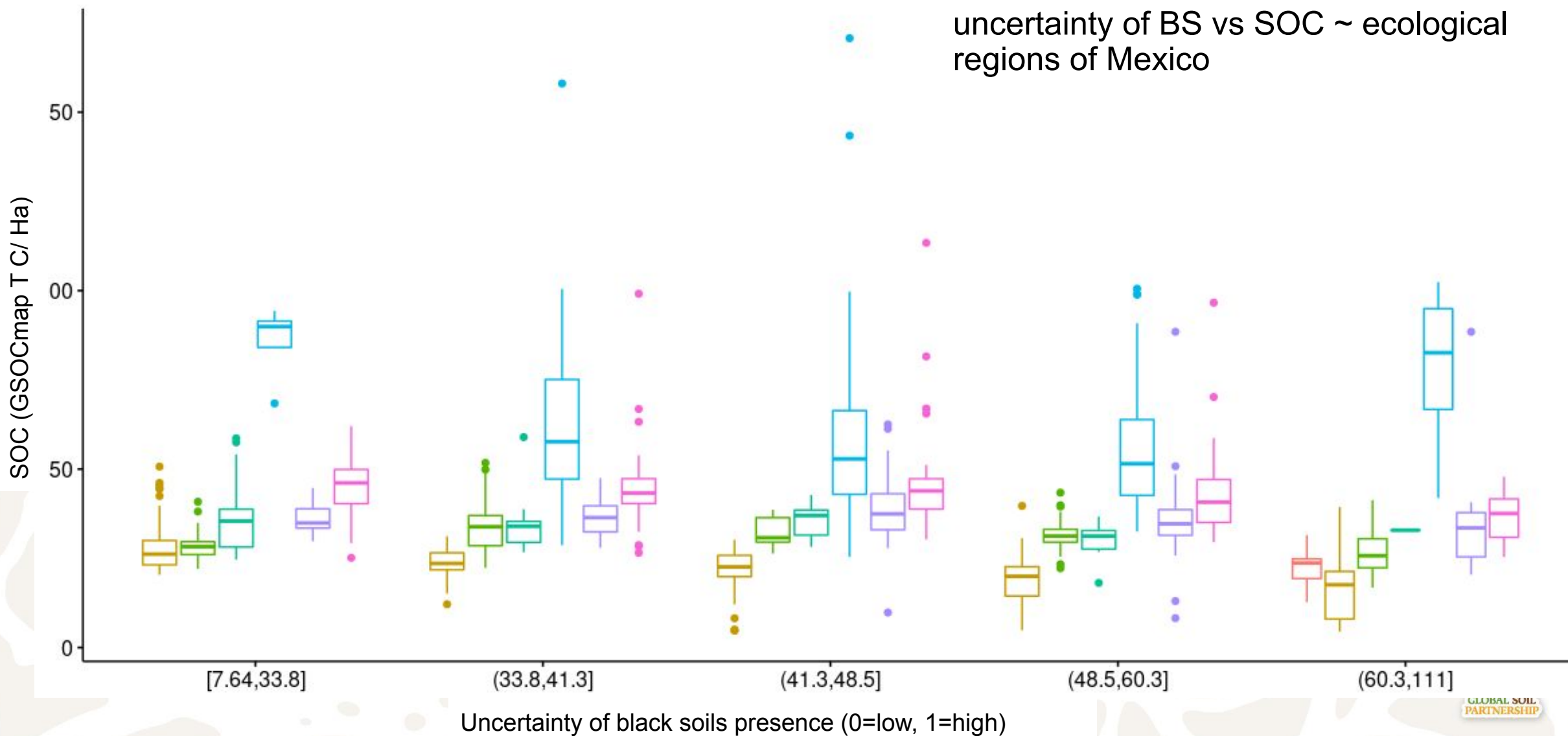
BS vs SOC ~ ecological regions of Mexico



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California Mediterranea	Elevaciones Semiáridas Meridionales	Selvas Calido-Humedas	Sierras Templadas
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uncertainty of BS vs SOC ~ ecological regions of Mexico





Histosol



Fluvisol



Vertisol



Leptosol



Gleysol



Plintosol



Arenosol



Acrisol



Luvisol

Palma, David & C., E. & Rincon-Ramirez, Joaquin & T., E.D.. (2008). Degradación y Conservación de los Suelos de Tabasco.

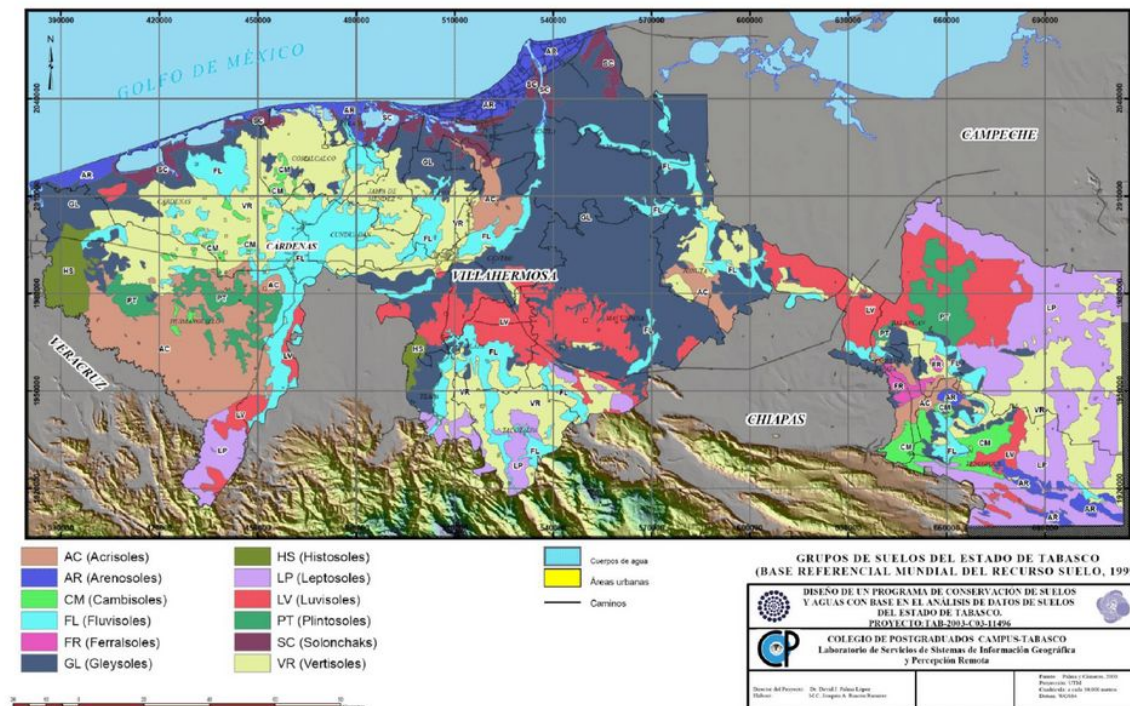
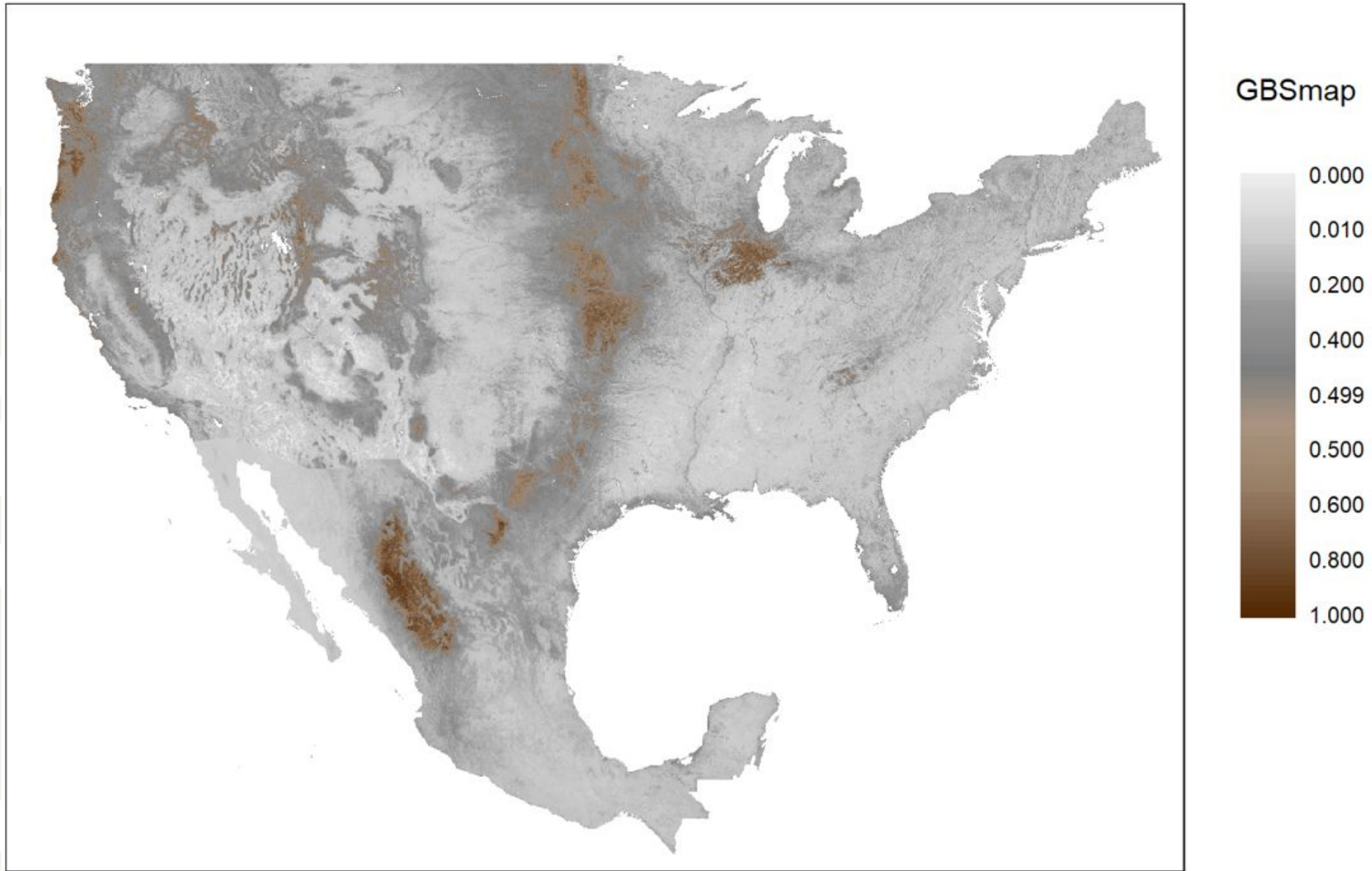


Figura 5. Distribución de los grupos mayores de suelos del estado de Tabasco, México

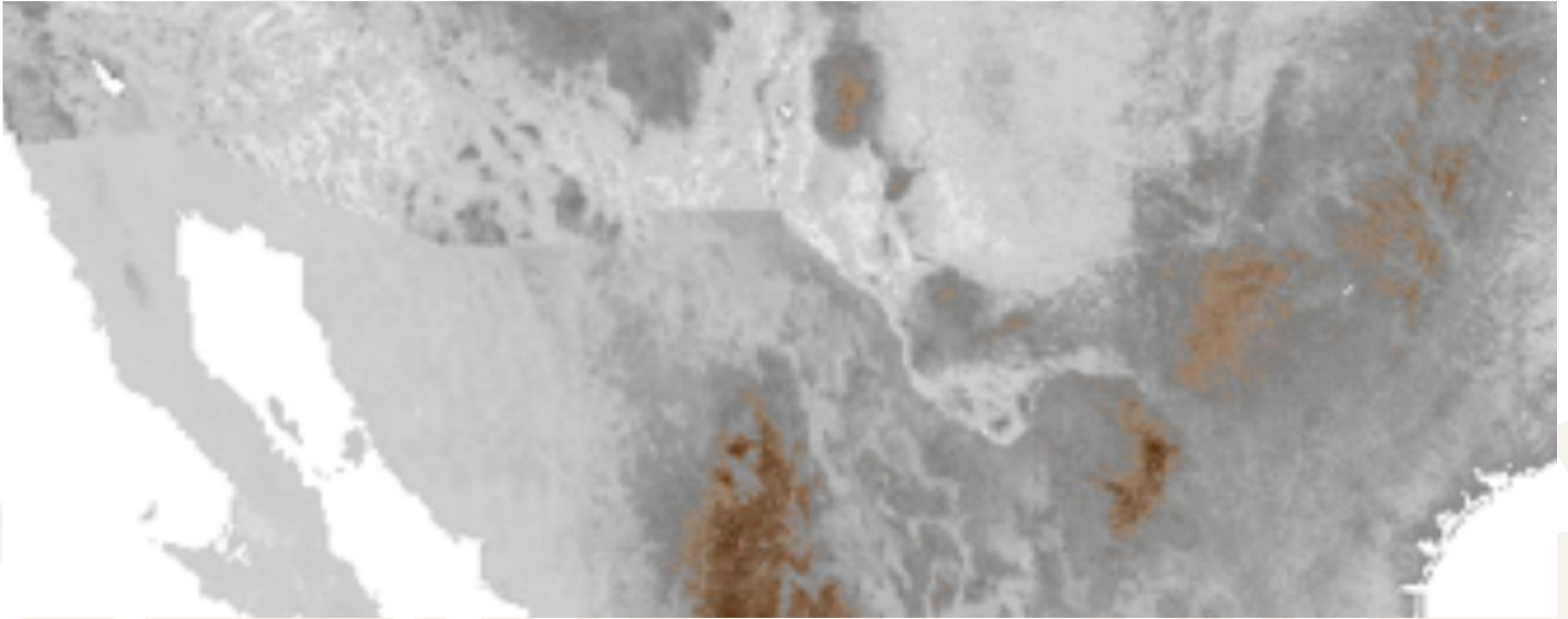
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Emergent opportunities for collaboration



Emergent challenges (e.g., border issues)



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Main conclusions and future directions

- First digital effort to quantify BS in Mexico
- Only 20 points meet the BS criteria, but large potential distribution of BS in Mexico exist
- Optimistic accuracy benchmark but prediction variance (and uncertainty) highlight the effect of low density of training points.
- Reduce uncertainty, and improve predictions collaborating with other participant countries



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