Setting up a prototype seasonal forecast in Peru with a focus on agriculture

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MOTIVATION

Prediction of user relevant indices may be more beneficial for specific applications than predicting mean values at the seasonal scale.
Within the Climandes project, prototype seasonal forecasts of indices have been developed. However, many challenges remain, such as the quality of observational data, the limited skill for some indices and time periods as well as the communication of uncertainty and skill to the end users.

This contribution shows the different steps of setting up this prototype seasonal forecast system including the challenges and possible solutions for one examplary index: % days within optimal temperaturerange for beans (growing phase).

DATA

Seasonal forecasts:

ECMWF system 5 seasonal prediction system (bias corrected with quantile mapping to observation sites)

Verification data:

Homogenized station data from SENAMHI for the Puno and Cusco regions

Time period (verification):
1981-2010

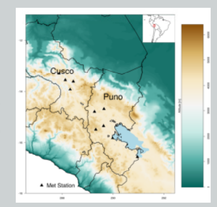


Fig. 1 Study area.

Challenges:

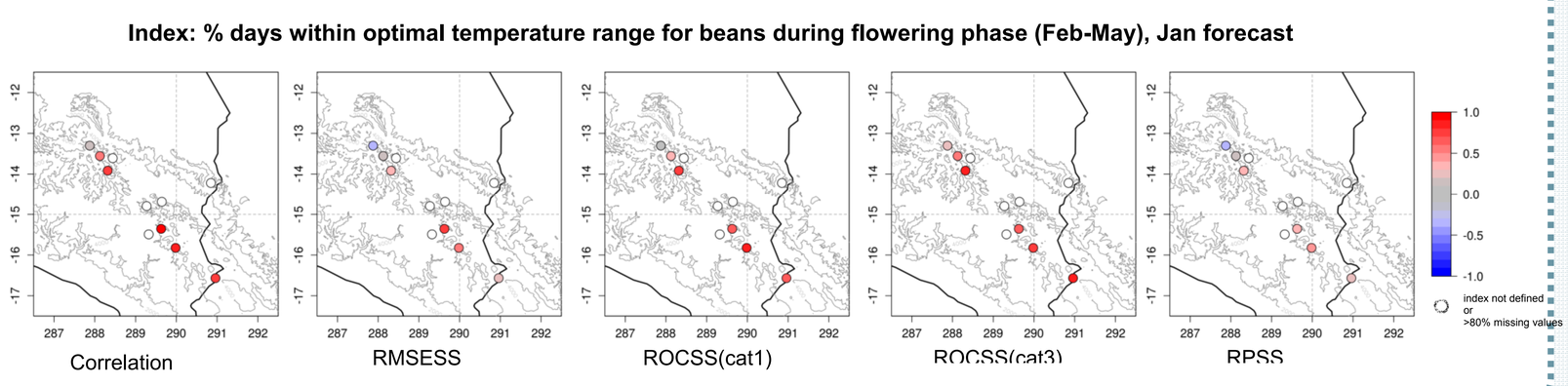
- Availability of high quality datasets for verification due to low station density, poor performance of re-analysis datasets
- Missing values in observational data

⇒ *„% days“ instead of „number of days“ to account for missing values*

⇒ *Missing value filter defining a maximum number of NAs in respective time period*

Verification

Figure show verification of selected indices using different verification metrics (1981-2010)



Challenges

- Low skill of seasonal forecast, especially for precipitation and precipitation based indices

⇒ *Improvement of skill by postprocessing is work in progress*

Selection of skill criteria

Which skill metric is most relevant for users? Or should a combination of skill metrics be used?

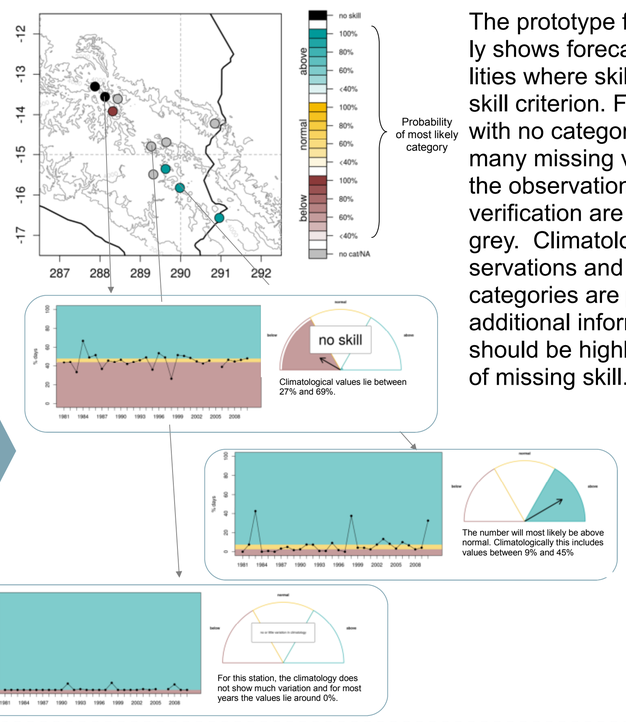
- How „good“ does a forecast have to be in order to be „useful“?

⇒ Our arbitrary choice: EnsRocss with minimum skill of 0.5

What is your opinion?

Please leave comments and suggestions:

Prototype seasonal forecast



The prototype forecast only shows forecast probabilities where skill fullfills the skill criterion. Forecasts with no category or too many missing values in the observations used for verification are shaded in grey. Climatology of observations and respective categories are provided as additional information and should be highlited in case of missing skill.

VERIFICATION METRICS

In addition to correlation, different skill scores are used for verification of seasonal forecasts, thus the added value of the forecast over using the climatology is assessed. For all scores, the perfect value is 1.

Correlation: (Pearson) Measures strength of linaer **association** between ensemble mean and observations

RMSESS[1]: Measures the average magni tude of forecast errors compared to clima tology (**accuracy**)

ROCSS[2]: Measures how well forecasts can distinguish between categories com pared to using climatological proba bilities (**discrimination**)

RPSS[2][3]: Measures how well the given ca tegories can be predicted com pared to using climatological proba bilities (**discrimination, reliability and resolution**)

References:
[1] Jolliffe, I., and D. Stephenson, Eds., 2003: Forecast Verification. John Wiley and Sons, 257 pp.
[2] Mason I, 1982. A model for assessment of weather forecasts. *Aust. Meteorol. Mag.* **30:** 291-303
[3] Epstein, 1969. A Scoring System for Probability Forecasts of Ranked Categories, *J Appl. Meteor.* **8:** 985-987

TOOLS

The R-package **ClimIndVis** was used for the calculation and generation of all graphics. For verification it relies on the easyVerification package.

The package is freely available on GitHub and can also be used for calculation of trends and climatology of indices:

www.github.com/Climandes/ClimIndVis

CONCLUSIONS & OUTLOOK

A protoype of a seasonal forecast product now exists, however two main challenges remain:
The definition of „useful“ forecast as well as the seasonal forecast skill in the region.
To overcome these issues, postprocessing tequniques are currently explored and the testing of the prototype forecasts on users , e.g. to adjust the visualization.

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