SWIOCOF TECHNICAL REPORT

South-West Indian Ocean Climate
Outlook Forum (IOC Area)

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1 OBJECTIVES OF SWIOCOF

The first South-West Indian Ocean Seasonal Outlook Forum was held between 24 September and 2 October 2012 in 2 phases: the first (Pre-Forum) on 24-28 September and the second (Forum) on 1-2 October.

During the Pre-Forum technical aspects of seasonal outlook were studied, with a twofold objective: i) to understand and assess the impact of large-scale climate variability in the IOC area, and ii) to assess seasonal-based predictability in the IOC area, so as to reach a forecast consensus on the October-November-December (OND) 2012 quarter.

Pre-Forum work was recapitulated during the Forum and discussions were held between prediction providers (meteorological or climate centres) and potential users of such predictions (delegates from environment services and "climate-sensitive" activity sectors).

During this SWIOCOF, special emphasis was put on rainfall prediction for the last quarter of the year (OND) which, in most countries of the area, is the end of the dry season, with common challenges regarding water resource management.

This Report is basically a synthesis of Pre-Forum work.

2 SEASONAL SCALE PREDICTABILITY SOURCES IN SWIO

2. 1 Fundamentals

Seasonal scale predictability includes two components. The first is the intrinsic predictability to a given area, which will depend on climatic and geographical criteria, especially the impact of large-scale climate variability on the area studied. The second is the contextual predictability directly linked to the present state of the climate system (ENSO or IOD phase, quality of ocean-related atmosphere coupling). In this part we shall study the first component of predictability thanks to a sufficiently long history (1979-2010).

It is agreed that the main source of seasonal scale predictability lies in tropical oceans, particularly the Pacific, which is the main driver of inter-annual variability in the ocean-atmosphere coupled climate system, especially through ENSO. The Indian Ocean nevertheless has its own variability modes, in particular the Indian Ocean Dipole (IOD), which is highly connected with ENSO but can, in certain years, develop positive or negative phases independently from ENSO.

SST anomalies linked to such large-scale ocean oscillations impact the atmosphere, bringing about large, direct changes in major atmospheric circulations (in particular Hadley-Walker) in connection with the east-west shift of major convection poles normally affecting the Indonesian maritime continent and equatorial Africa.

Seasonal scale predictability of a given area therefore largely depends on the impact of changes in major atmospheric circulations (either directly as in Hadley-Walker or through remote connections) on regional climate, and in particular (but not only) rainfall.

2. 2 Data and Tools Used in the Workshop

Large-scale data (explicative variables):

- SST Reanalysis : ERSST data (1979-2010)
- Oceanic indices (NIÑO boxes, Indian Ocean boxes WTIO, SETIO, IOD)
- Atmospheric Reanalysis : ERA-interim data (1979-2010); MSLP (sea level pressure), Z850, Z700, Z500, Z250 (geo-potential fields at 850, 500 and 250hPa), U850 (zone wind at 850hPa), V850 (meridian wind at 850hPa), U200 (zone wind at 200hPa)

Regional or local scale data (variables that we try to explain)

- Precipitation data on GPCP grid point (2.5° resol ution) (1979-2010)
- Local precipitation data from country stations (1979-2010)

It should be noted that in this workshop we had no analysis tool for high troposphere velocity potential; this gives useful information on mean positioning of ascending or subsidence branches of Hadley-Walker cells and their anomalies. Usefulness of such analysis tools will be tested in a future workshop.

Software tools

The CPT (Climate Predictability Tool) programme developed by IRI was the main tool used during the workshop. In addition, scripts allowing to perform composite analyses were also prepared.

Statistical methods

Composite analyses, CCA (Canonical Correlation Analysis), PCA (Principal Component Analysis), Verification scores.

2. 3 Regional Scale Predictability

GPCP (Global Precipitation Climate Project) gives an estimate of global monthly precipitations with 2.5° horizontal resolution. CPT software allows to quickly collate GPCP data series with stations data and assess their relevance. It quickly appears that for the OND season, GPCP data accurately reproduce rainfall linked to deep convection mainly to be found north of the area within the nascent ITCZ. Further south, rainfall linked to generally smaller cloud developments are less accurately described in GPCP data. These data were therefore used to study large-scale precipitation response to main sea surface temperature and atmospheric circulation variability modes.

The first approach consists in analysing Indian Ocean (IO) rainfall response by drawing composite precipitation maps for the OND quarter in years corresponding to positive and negative phases of the inter-annual Indian Ocean (IOD) variability mode.

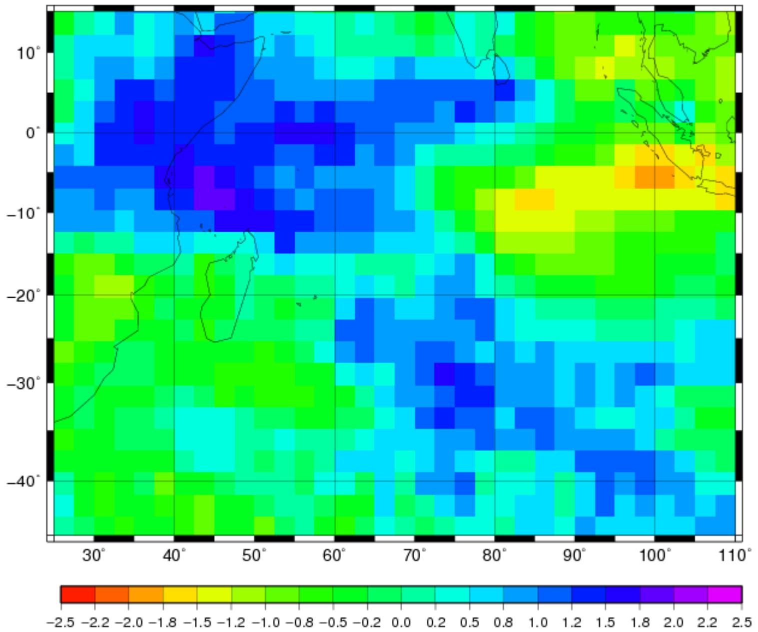

Figure 1: Composite of standardised GPCP rainfall anomaly during positive IOD phases (upper tercile). Excess precipitations go from blue to purple, insufficient precipitations from light green to red.

Figure 1 shows that during positive IOD phases there is a clearly marked large-scale rainfall response in the Indian Ocean equatorial waveguide (between 10N and 10S), with positive rainfall anomaly west of 70-80E and negative anomaly further east. Further south (around 20S), response is weak. This is consistent with what we know about the eastward shift of the Walker cell ascending branch, which comes above abnormally warm waters accumulated during ENSO and/or IOD positive phase along the East African coast. The eastern part of the basin is then affected by the subsidence branch of the same cell, usually centred in the west of the equatorial basin.

It should be noted that positive IOD phases rather correspond to ENSO negative phases (Niño type events). The same type of analysis was made for negative IOD phases as well as for positive and negative ENSO phases.

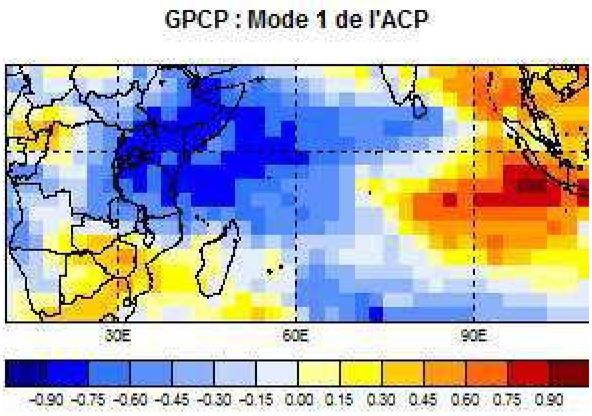

Figure 2: [GCPC: PCA Mode 1] Spatial structure of the first GPCP rainfall Eigen vector (EOF1) for the OND quarter. The map shows correlations between GPCP data and CP No. 1.

Figure 2 shows the pattern of the first PCA mode on GPCP rainfall. The spatial structure in this frequently used IO precipitation variability mode is very similar to that of composite analysis found in Figure 1, with symmetrical response between east and west in the equatorial waveguide. This implies that the main variability mode of large-scale precipitation in tropical IO during the OND period is determined by the variability of ENSO and IOD events. This clearly appears in Figure 3, which shows the first canonical modes between i) SST in a tropical Indo-Pacific domain and ii) GPCP rainfall on the IO. Canonical correlation between the two variability modes is 0.97.

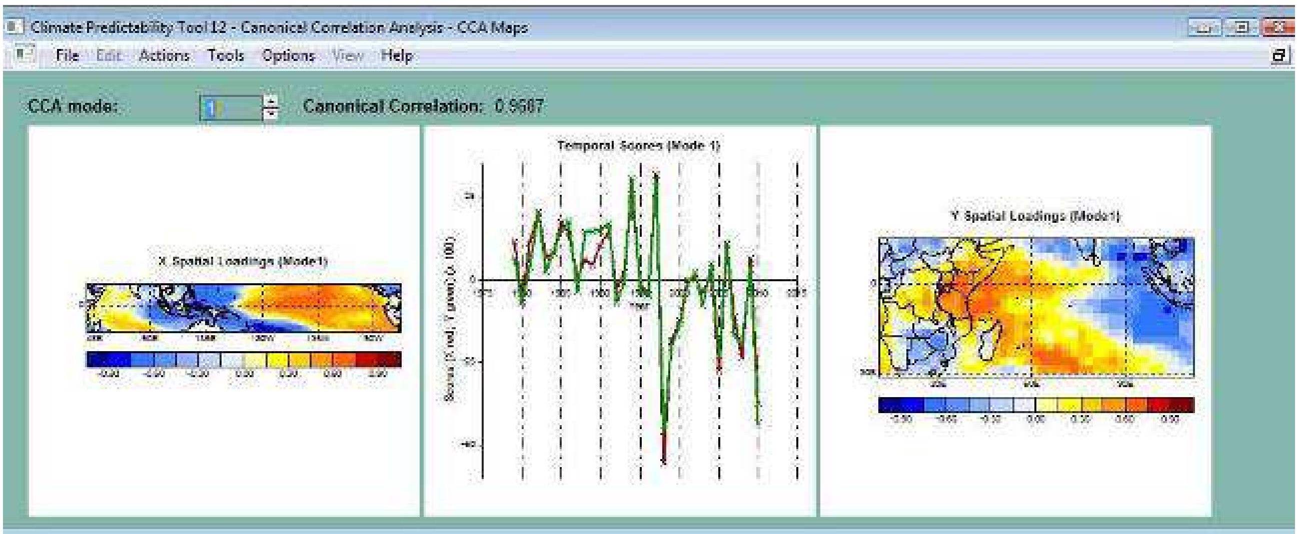

Figure 3: Spatial structure of the first CCA modes between SSTs (left) and GPCP rainfall (right). The right map shows correlations between SST data and the associated canonical component (red series on central graph); the left map shows GPCP data and the associated canonical component (green series on central graph).

Figure 4 shows the first canonical mode between zonal wind at 850hPa (ERA-Interim data) and GPCP rainfall. The spatial structure used in this mode for precipitations (right) is similar to that shown on Figure 2 and seems to be highly correlated (0.98 in canonical correlation) with zonal wind variability at 850hPa along the Equator. This signal is highly consistent with the signal obtained on SSTs, especially related to expected changes in IO Walker circulations.

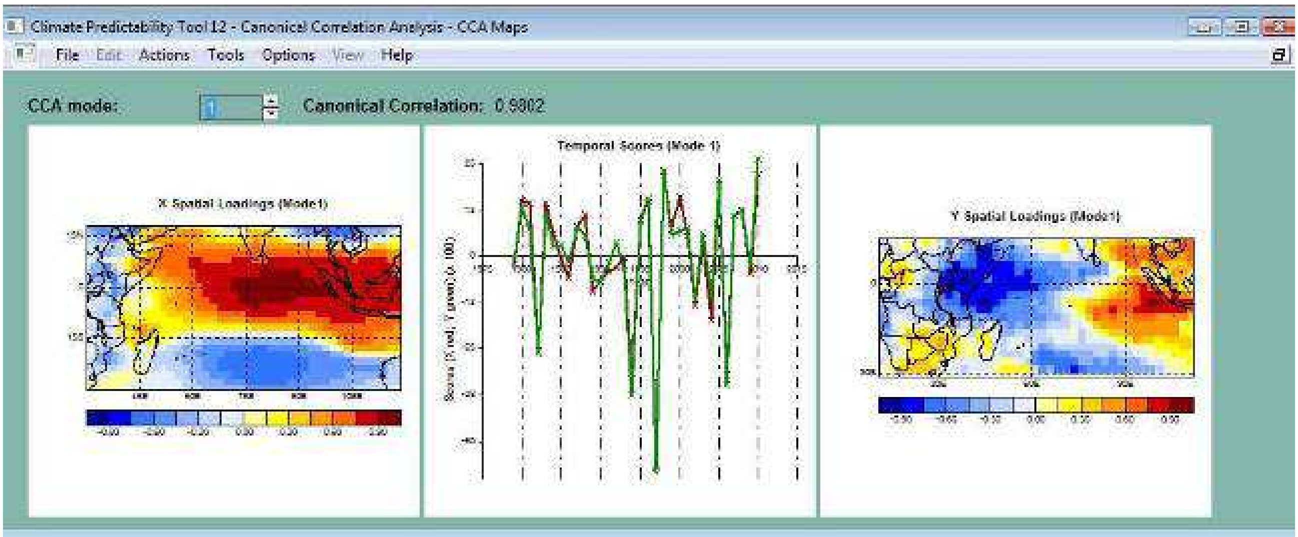

Figure 4: Spatial structure of first ACC canonical modes between U at 850hPa (left) and GPCP rainfall (right). Same legend as in Figure 3.

These first elements lead us to think that seasonal scale and OND quarter predictability gives good results in the north part (from Tanzania to Seychelles to Sri Lanka). Those areas are directly impacted by tropical Indian and Pacific basins SST inter-annual variability and its subsequent Walker circulation changes. The Comoro archipelago and the north of Madagascar are on the edge of such influence.

Further south (south of 15S), predictability seems weaker where GPCP rains, mainly reflecting variability of precipitations generated by deep convection, are taken into account. However, if one focuses on this south part of the area, CCA made between i) zonal wind at 850hPa and 200hPa (ERA-Interim data) and ii) precipitation field show that in the Mascarene Islands in particular, precipitations are fairly well correlated with zonal structures located between 20S and 30S (Figures 5 and 6). Seasonal scale anomalies on trade wind patterns and the western subtropical jet therefore seem to partly condition the behaviour of large-scale precipitations on the Mascarenes in OND. This can be seen as a regional scale response of low- and high-troposphere area circulation to Hadley circulation anomalies, in particular in the subsidence branch of such circulation.

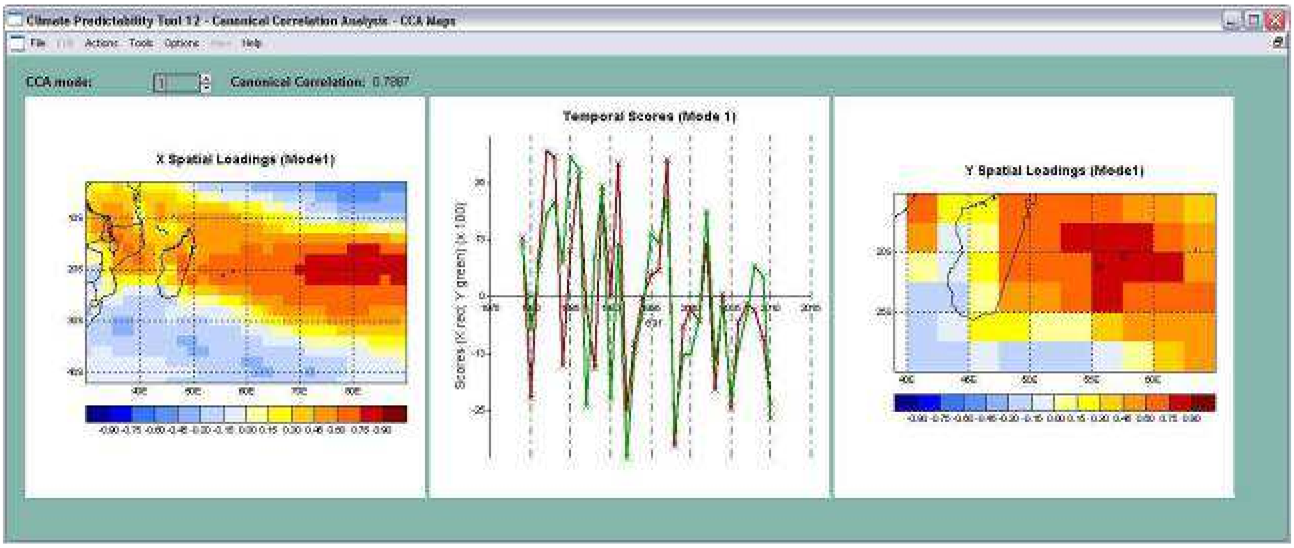

Figure 5: Spatial structure of first CCA modes between U at 850hPa (left) and GPCP rainfall (right, south of 15S). Same legend as Figure 3.

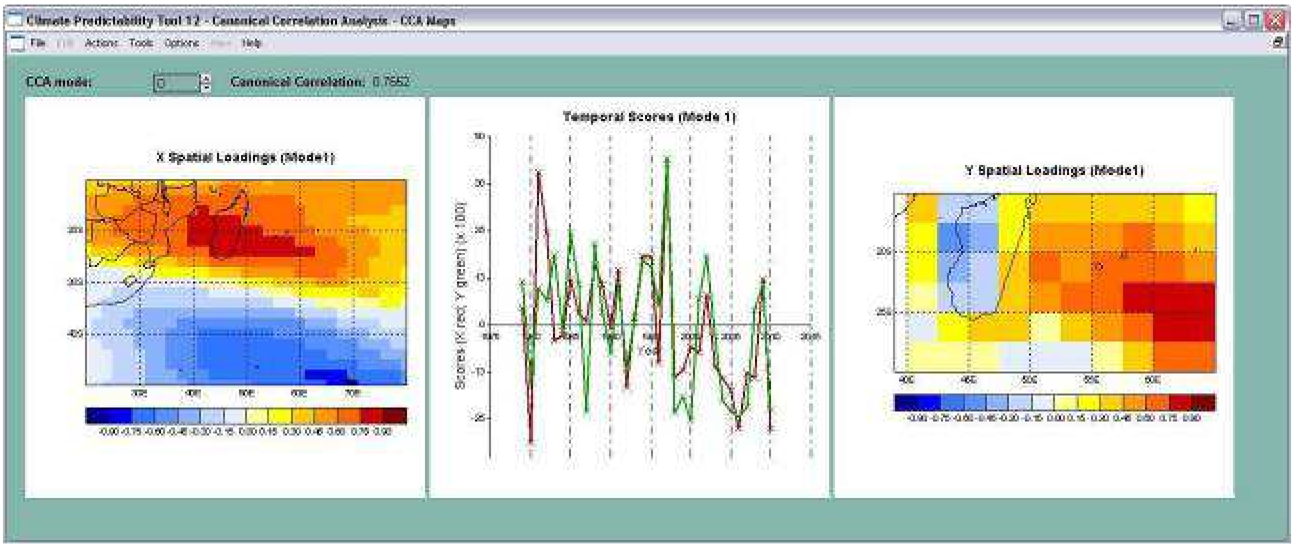

Figure 6: Spatial structure of first CCA modes between U at 200hPa (left) and GPCP rainfall (right, south of 15S). Same legend as in Figure 3.

2. 4 Assessment of the Best Predictability Sources for Each Country

The last piece of work upstream of the statistical downscaling we want to implement in order to perform seasonal forecast consists in searching for large-scale information (from ERA-Interim data) that can be of use to explain local scale precipitations. Here we no longer use GPCP precipitations, but directly data series supposed to represent spatial variability of precipitations in each country.

Note: Partition into homogeneous zones is highly recommended, even if it was not possible to do this for all countries present.

The regional approach presented in the previous section is useful when it comes to choosing the most relevant predictors. However, in countries or territories with strong local specific features such as Reunion Island or Madagascar, predictors and geographical zones containing relevant information can be modified.

Two methods are used: Composite Analysis and Canonical Correlation Analysis. Composite Analysis consists in drawing large-scale field anomalies for abnormally dry or wet years in a given territory. Figure 7 shows the composite of field U850 for abnormally dry years in west of Reunion Island, the trade winds were stronger than usual for these years.

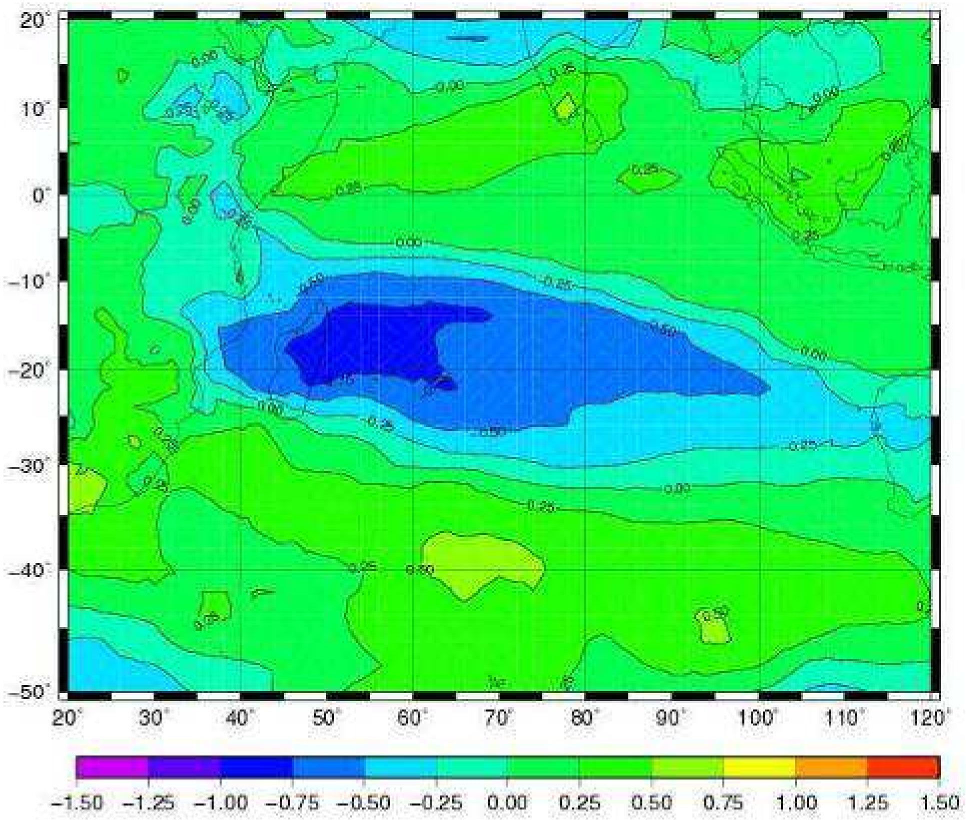

Figure 7: Composite of field U850 (standardised anomaly) for abnormally dry years west of Reunion Island.

It is also extremely interesting and relevant to make symmetrical analysis on the basis of large-scale indices (such as IOD, Niño indices or SOI, to name just a few) and by drawing the composites of precipitation fields observed for high values (positive and negative) of such indices. Figure 8 shows a clear signal of excess rainfall, especially on the north part of the Tanzanian coast in positive IOD phase. The negative phase signal is not perfectly symmetrical, but rather seems to indicate a slightly negative response.

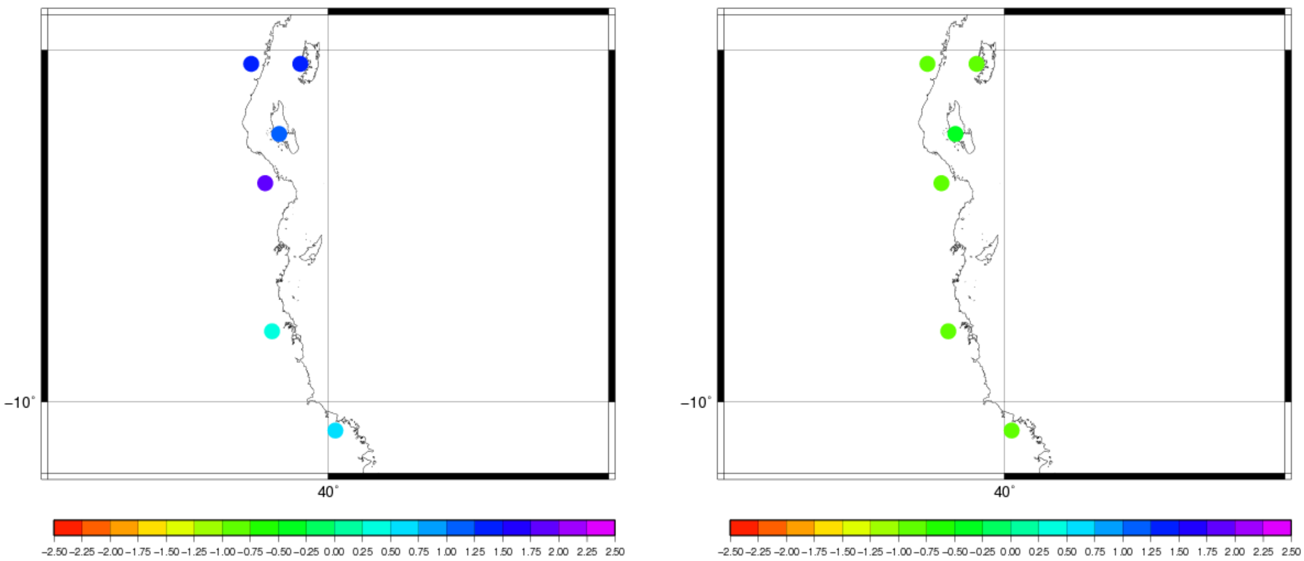

Figure 8: Composites of standardised rainfall anomaly on the Tanzanian coast during positive IOD phases (upper tercile, left) and negative IOD phases (lower tercile, right). Excess rainfall goes from blue to purple, rainfall deficits from light green to red.

Canonical analysis helps to detect “correlation modes” between two fields; the spatial structures of a large-scale field best correlated to our local rainfall field are investigated here. Also, as a sufficiently wide domain is used, this type of analysis makes it possible to target the more strongly correlated zones and therefore adjust the domain where useful information is sought.

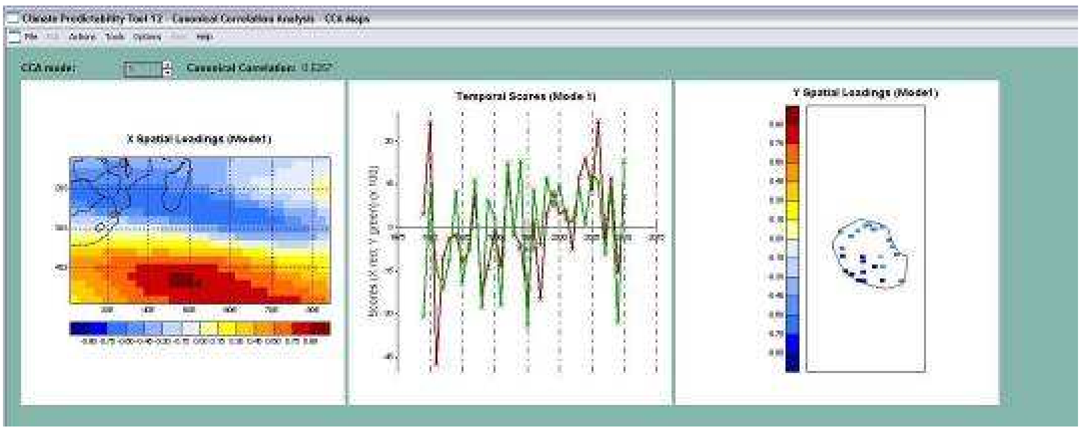

Figure 9: Spatial structure of the first CCA modes between U200 field (left) and rainfall (cumulated OND, right) for La Reunion Island stations. Same legend as in Figure 3.

Figure 9 shows fairly good correlation between a variability mode around west subtropical jet and La Reunion precipitations, especially in the island's southern stations.

Search for the best large-scale explanatory variables was performed by all countries taking part in the Forum. Generally speaking, predictors giving the best scores in explaining the local variable are SST and zonal wind at 850hPa and 200hPa.

Note: Some countries also tested the robustness of statistical models by removing "extreme" events (outliers) likely to have too much weigh in the calibration of the model and on the corresponding statistical scores such as, for instance, Pearson correlation. Tests were therefore made by removing certain years from the sample (for instance 1997 – remarkably strong Niño episode). This is all the more important for countries where rain is strongly dependent on ENSO or IOD oscillation.

3 OND 2012 OUTLOOK

3. 1 Correction of Climate Model Biases and Choice of Downscaling Models

Assessment of predictability sources documented in the first chapter draws on the analysis of observations made between 1979 and 2010, both for local and large-scale data (ERA-Interim or ERSST). For prediction, we use seasonal prediction System 3 based on the ARPEGE model.

Global climate patterns are known to present a number of biases and, depending on geographical areas and event type, cannot easily reproduce certain large-scale variability modes. Useful data investigated and identified during upstream phase may not be correctly represented in ARPEGE (intensity, geographical shift, etc.).

Whether the prediction model can bring the useful information sought can be checked using ARPEGE's hindcast data set (used by the GPC Toulouse) covering the 1979-2007 period. For instance, useful information may have a different geographical location from that of observation in the ARPEGE model.

A number of those biases can be corrected under the CPT software by readjusting the downscaling models we made (see section above) on the basis of observed data. We therefore use a Model Output Statistics (MOS) adaptation method rather than a Perfect Prediction (PP) method. As a result, final choice of statistical downscaling model(s) chosen for prediction is a compromise between predictor's intrinsic capacity to explain variability on precipitations and climate model (here ARPEGE) capacity to represent such predictor.

For instance, it is agreed that climate models cannot easily reproduce general circulation variability in mid-latitudes. It is therefore necessary to limit the search for useful information to tropical or subtropical latitudes; this is a drawback for territories such as Reunion, as part of the island's rainfall depends on southern circulations that can have breaking Rossby wave to corresponding latitudes. Limiting the geographical area therefore brings down statistical model scores, as useful information is lost. Figure 10 shows the geographical domain finally exploited in the downscaling model based on U200 field for La Reunion Island.

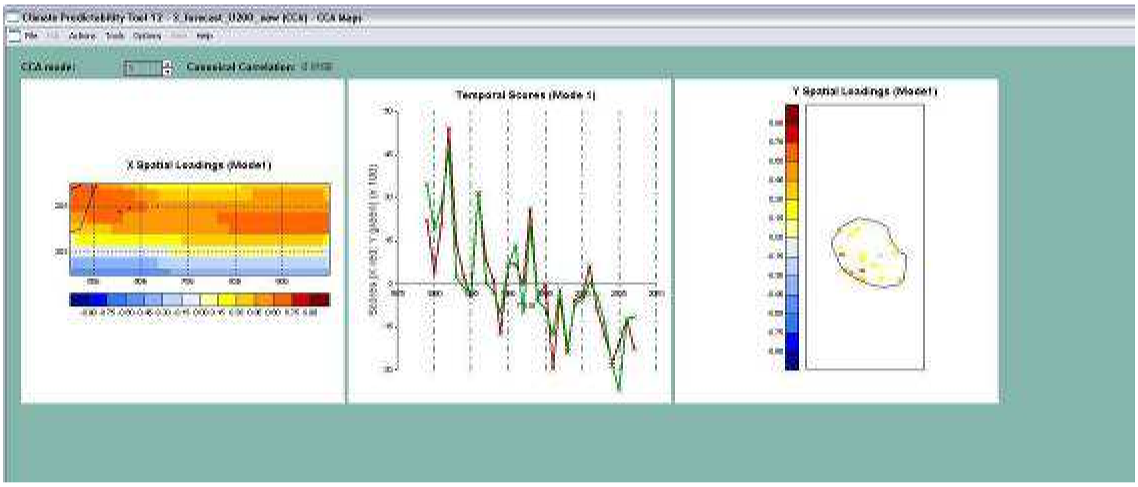

Figure 10: Spatial structure of the first CCA modes performed between the hindcast of U200 field (left) and rainfall (cumulated OND, right) in La Reunion Island stations.

3. 2 Summary of Downscaling Models Used for Each Country

Following work described in Sections 2.4 and 3.1, each country eventually chose one or several statistical downscaling models using the ensemble Météo-France's ARPEGE model predictions (41 members) as input. The comprehensive approach makes it possible to assess uncertainty linked to large-scale contextual predictability based on the present state of the climate system (ENSO or IOD signal, Ocean/Atmosphere coupling, etc.).

The choice of downscaling models used draws on comparative analysis of statistical scores obtained by taking into account training period (1979-2007) of the hindcast data set. In particular, CPT software allows not only to visualise correlation scores (Pearson or Spearman) station by station, but also to calculate hit or false alarm rates, to display ROC diagrams for "above" our "below" normal categories, or to visualise contingency tables.

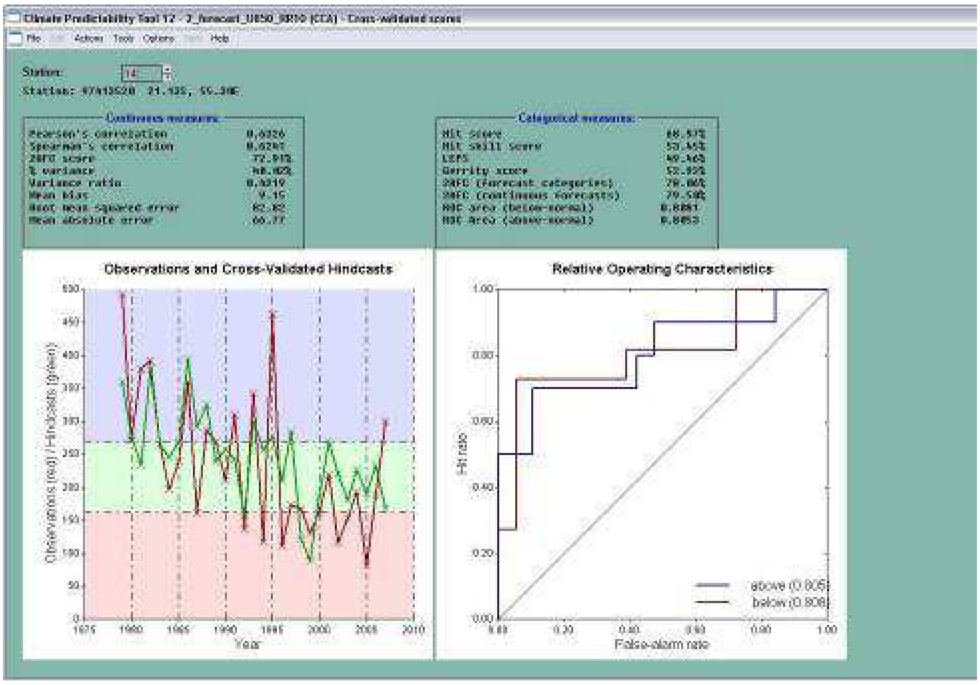

Figure 11: Summary of scores for Les Colimaçons station (La Reunion Island) and for the model based on U850 field (12S/39S – 20E/90E)

Final models chosen for each country and OND 2012 outlook are summarized in the following table:

COUNTRY	MODELS	DOMAIN
SRI LANKA	U850 SST	05N/25S – 60E/110E 10N/30S – 75E/130E
SEYCHELLES	U200	5N/18S – 30E/107E
TANZANIA	SST U200	Tropical Pacific Indian Ocean, Equatorial Corridor
COMOROS	SST U850 V850	Tropical Pacific Tropical Indian Ocean Tropical Indian Ocean
MADAGASCAR	SST SST SST	East Area: 9N/15S – 31E/109E South-West Area: 9N/20S – 85E/140E North-West Area: Tropical Pacific
MAURITIUS	SST SST	10S/35S – 35E/65E 04S/22S – 31E/94E
FRANCE (Reunion Island)	U850 SST U200	12S/39S – 20E/90E 02N/31S – 38E/80E 17S/34S – 36E/110E

FRANCE (Mayotte)	U200	12S/27S – 30E/50E

3. 3 OND 2012 Regional Outlook

One of the Forum’s objectives was to elaborate consensus forecast among countries. Regional forecast was developed on the basis of downscaling models built from GPCP data and then approved by all. Forecast drew on 4 models using SST, U850, U200 predicted fields and ARPEGE model’s raw RR for tropical and subtropical Indian Ocean domain. This “multi-model” approach is interesting in that it allows to evaluate both the uncertainty linked to the downscaling method used and the uncertainty linked to the quality of ocean/atmosphere coupling, as one model solely based on SST and 2 other models solely based on atmospheric circulation parameters were made. Those models converge towards one same signal, therefore providing quality information on how trustful the results are.

Figures 12 and 13 show scores for all grid points in the 4 models. A certain degree of spatial consistency can be observed in terms of model quality. Areas north of 10S score very well in terms of correlation and ROC. Scores are clearly poorer further south. This is consistent with the upstream regional scale predictability study described in the previous section.

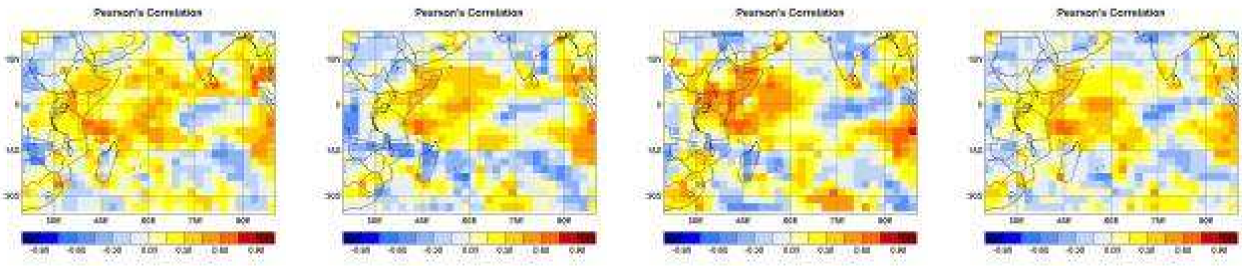

Figure 12: Correlation scores for SST, U850, U200 and RR models (respectively from left to right).

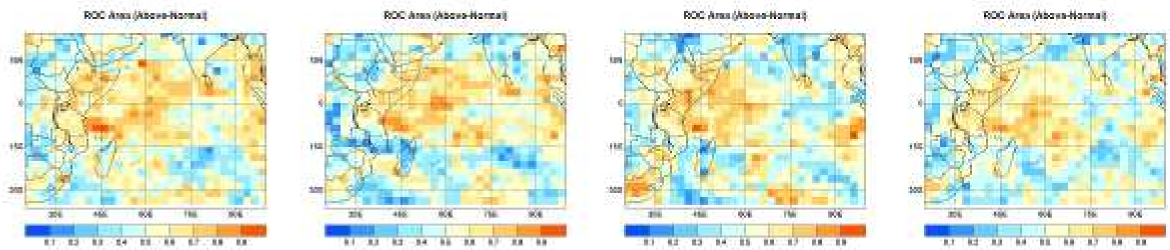

Figure 13: Above normal category ROC scores for SST, U850, U200 and RR models (respectively from left to right).

Figures 14 and 15 below show probabilistic forecast for OND 2012 for “above” and “below” average categories in the 4 models. Good prediction consistency can also be seen among the various models, with a signal clearly above normal north of 10S (probability above 70% in general). In Madagascar, above normal signal dominates but is less strongly marked (probability closer to 50%). Lastly, the Mascarene Islands have a fairly weak signal, rather below normal. It must be remembered, however, that the models’ performance in Madagascar and the Mascarene islands is very poor. In those areas downscaling should make it possible to fine-tune probabilistic predictions.

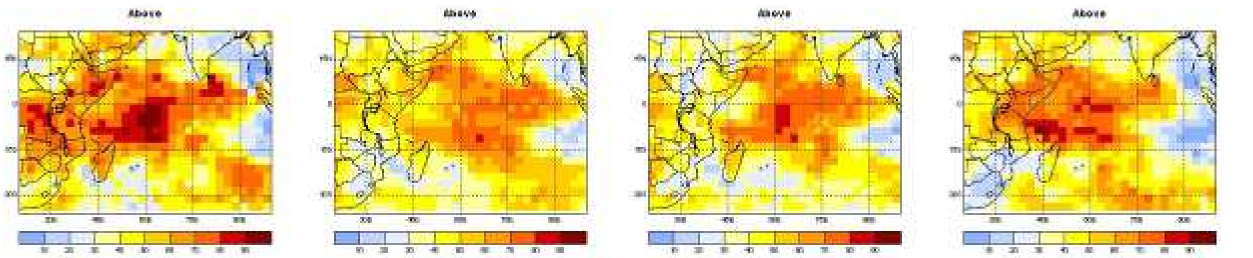

Figure 14: “Above normal” category probability (upper tercile) for SST, U850, U200 and RR models (left to right).

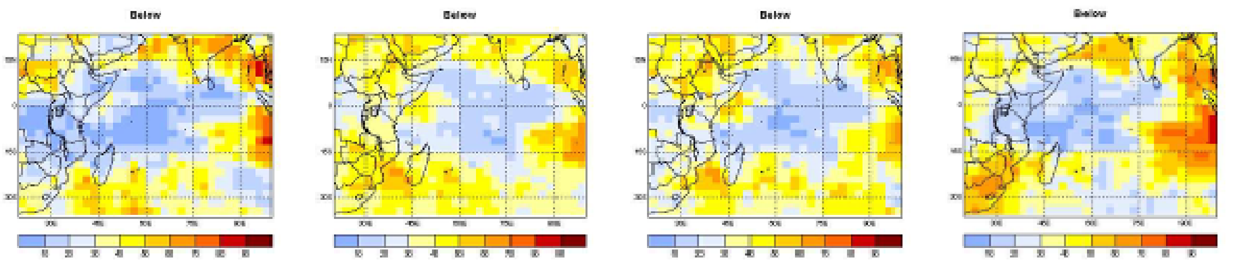

Figure 15: “Below normal” category probability (lower tercile) for SST, U850, U200 and RR models (left to right).

3. 4 Implementing Downscaling Models for Reunion Island for OND 2012

Through seasonal prediction as described in the previous section, a regional scale consensus was reached concerning rainfall level trend to be expected in OND 2012. However, small-size island states (a few dozen sq km) have their own specific features, especially if they have mountains, and regional predictions can be altered. In some territories such as Mauritius and Reunion Island, we also observed that statistical models based on GPCP data are probably rather weak, as GPCP data do not adequately take into account very local rains of orographic origin. It is therefore necessary to use station data, which reflect local scale rainfall. In this section we present predictions obtained on La Reunion Island through various models described in the Table in Section 3.2. On La Reunion, mountainous topography gives two major sub-areas relatively homogeneous in terms of rainfall: the south-west half (leeward zone) and north-east (windward). Downscaling is therefore aimed at producing specific seasonal prediction for each sub-area (hereinafter “SW” and “NE”).

Probabilistic information can be obtained through the ARPEGE ensemble prediction (41 members available); this can help to assess the prediction’s uncertainty, which is illustrated by the dispersion of the 41 individual predictions. In its current version CPT software does not allow to fully exploit the ensemble forecast. A graphic trick can be used to represent prediction dispersion in one given place: a different year (2012 to 2051) is assigned to each member of the ensemble forecast (see Figure 16). By merely counting the members in the above, below or around normal categories, it is possible to determine the forecasted probability for each category.

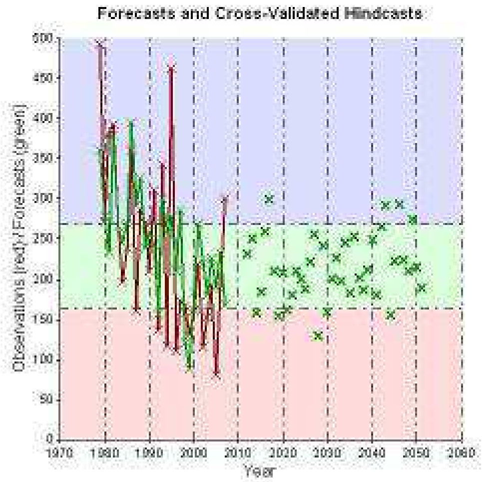

Figure 16: Example of ensemble prediction display with CPT software. Each cross represents one of the 41 members of ARPEGE forecasts. Les Colimaçons station (Reunion Island) – Prediction as per model U850-RR.

To allow full exploitation of information contained in ARPEGE ensemble forecast, raw prediction results were extracted from CPT subsequently to the Forum so that probabilistic graphs - easier to interpret by final users- could be made. They are presented further below.

Models used for Reunion Island are the following:

Explaining variable	Explained variable	Sub-area concerned
U850	Cumulated rainfall log: logRR	SW; NE
U200	Cumulated rainfall: RR	SW
U850	Threshold number of rain days 10mm: NBJRR10	SW; NE
SST	NBJRR10	SW; NE

Figure 17 shows model U850-NBJRR10 probabilistic forecast for all Reunion Island stations. Stations where Pearson correlation is above 0.4 are framed by a solid line; stations where correlation is between 0.3 and 0.4 are framed by a dotted line. To calculate predictions on Reunion Island's 2 major sub-areas, we exploited results from all stations with correlation above 0.3 (16 stations, 8 in each sub-area). Prediction shown in Figure 18 is obtained by simply calculating mean probability of occurrence in the 3 categories (defined by the lower and upper terciles) for stations of both sub-areas.

Another possibility would be to exploit results from all stations by calculating a mean weighted by Pearson's (or Spearman's) correlation coefficient. Depending on what use is made of the prediction, ROC scores could be used as criteria for selecting (or weighting) stations exploited for area-by-area prediction.

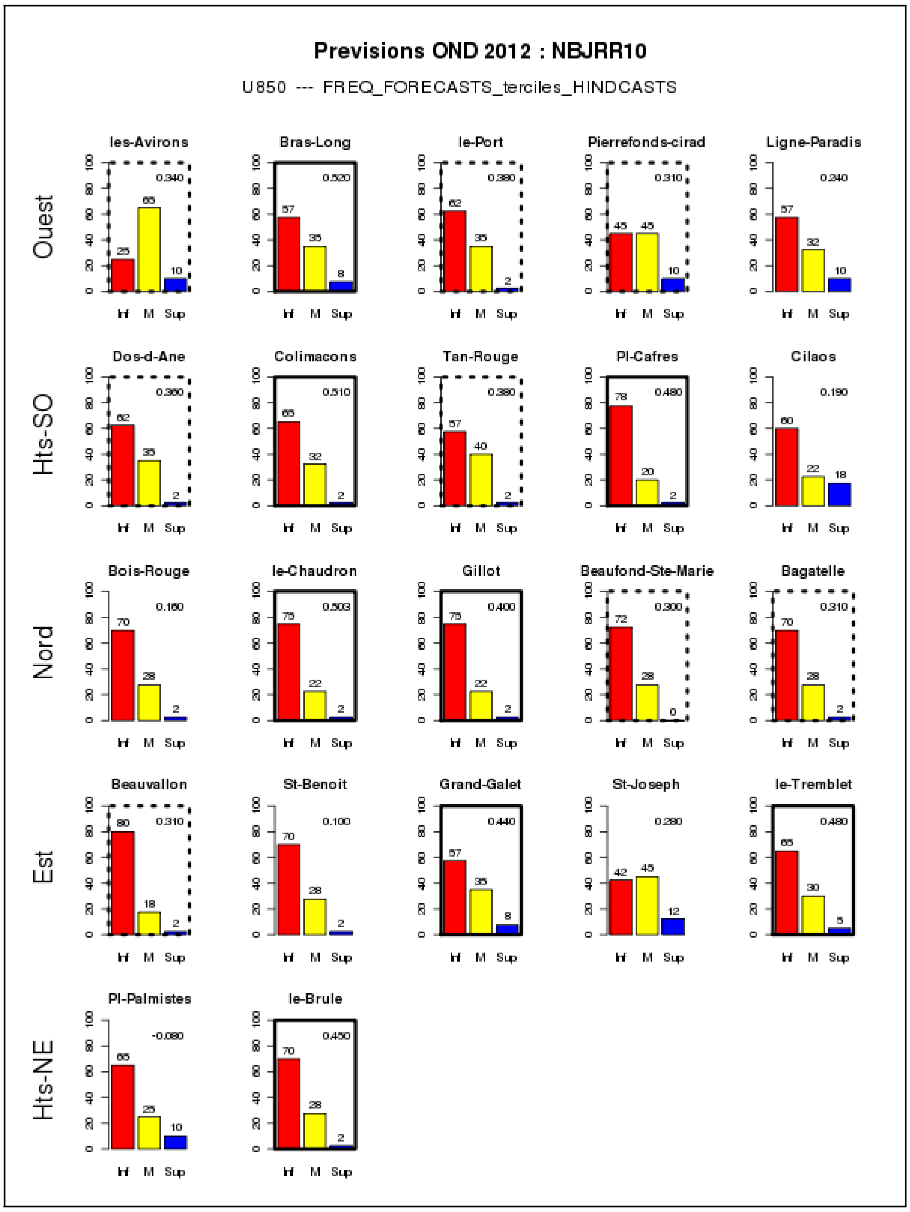

Figure 17: Probabilistic predictions by station for "below normal" (red), "above normal" (blue) or "close to normal" (yellow)categories as per model U850 – NBJRR10.

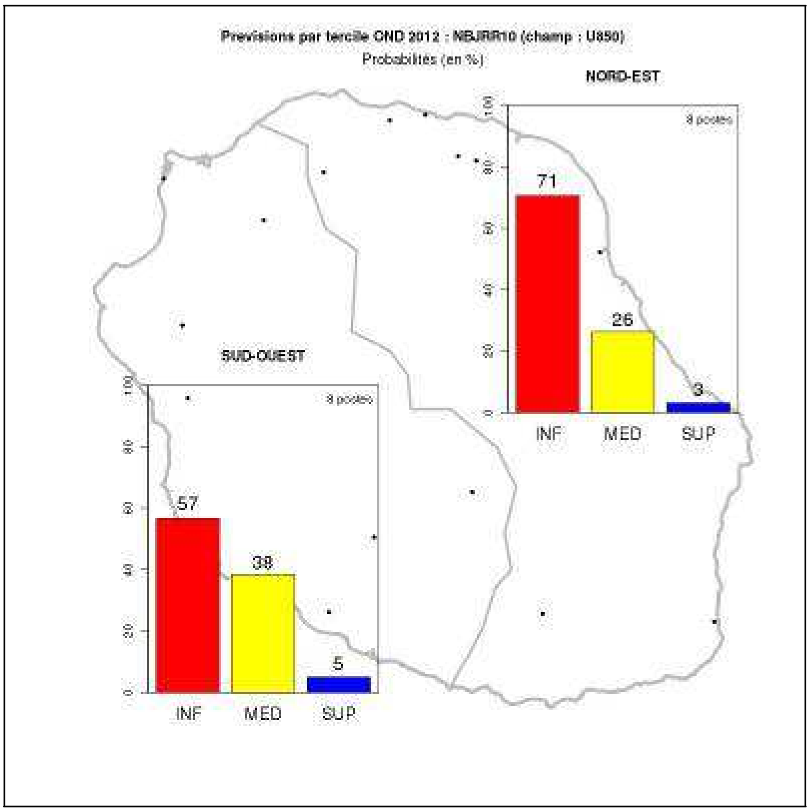

Figure 18: Probabilistic forecast for each sub-area for “below normal” (red), “above normal” (blue) or “close to normal” (yellow) categories as per model U850 – NBJRR10.

Figure 19 shows the same results as Figure 17 but as per model U200–RR. Note: All 5 stations with correlation above 0.4 are in the SW area. The model is very reliable for those 5 stations, since Pearson’s correlation is even above 0.5. Only 2 stations in the NE area (Saint-Joseph and Grand Galet) have a correlation above 0.3. Those 2 stations are geographically close and, in themselves, little representative of the whole NE sub-area, located as they are on its edge, i.e near the SW area. Model U200-RR is therefore not exploited for the NE area. Figure 20 shows SW area forecast.

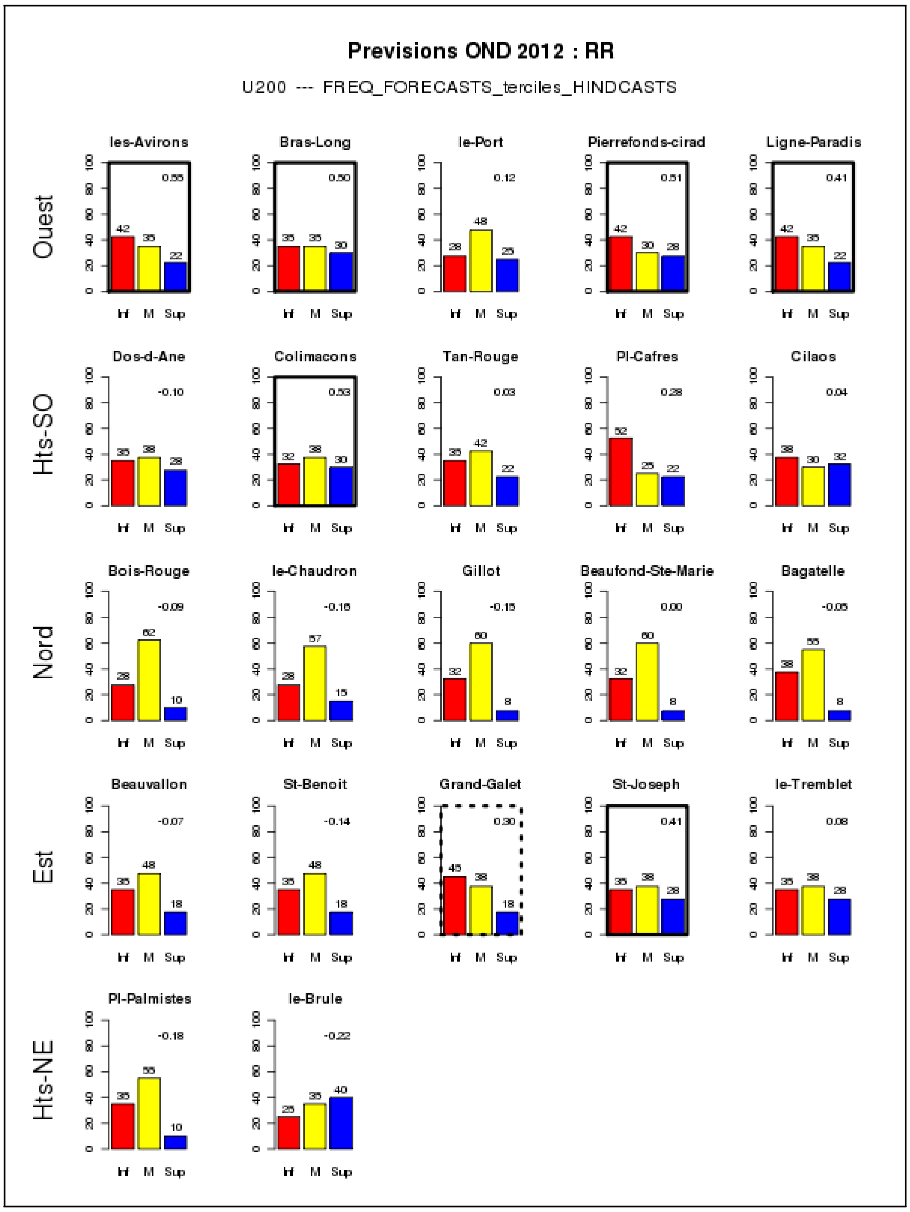

Figure 19: Probabilistic forecast by station for “below normal” (red), “above normal” (blue) or “close to normal” (yellow) categories as per model U200 – RR.

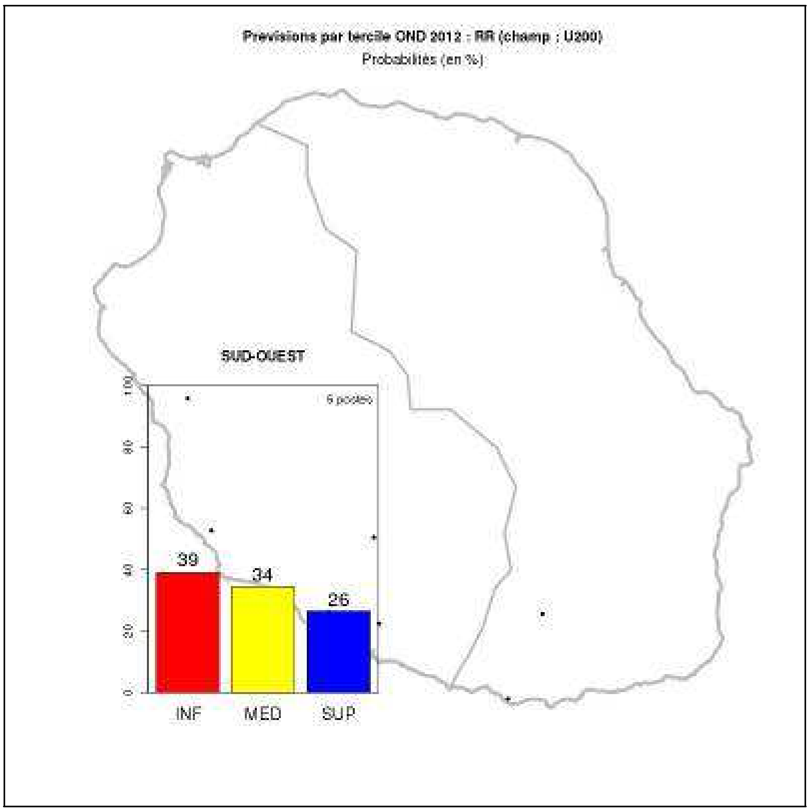

Figure 20: Probabilistic prediction by sub-area for "below normal" (red), "above normal" (blue) or "close to normal" (yellow) categories as per model U200 – RR.

Predictions based on the other 2 models (SST-NBJRR10 and U850-logRR) are not presented but give a similar signal; this confirms that such prediction can be trusted.

In summary, in the NBJRR10 variable, "below normal" signal is highly reliable for the 2 sub-areas (probability between 60 and 70%). In this variable, probability of quarter OND 2012 being higher than normal is very low (under 10% for both areas). In the RR variable (total cumulated rainfall in quarter OND 2012), the signal is less strong, with slightly higher probability of rainfall deficit in the SW area. This is certainly due to normal rainfall quantity in this area being low at this time of the year. Cumulated rainfall over the OND quarter is therefore strongly dependent on one or two consecutive rainy episodes, which tends to make the RR prediction in the SW area, at this time of the year, more "relative."

3. 5 Outlook Summary by Represented Countries

This section contains no detail of downscaling implemented in each country, as the corresponding methodology can be found in the preceding section. Country size and local specificities must be taken into account when breaking down territories into climatologically homogeneous areas; this is indispensable and highly relevant in Madagascar and Sri Lanka where rainfall differences are high due to the large size of these countries.

The following table gives an OND 2012 season rainfall prediction summary for each country. Details can be found in the presentations made by each country during Forum report session (Session 2).

Country	Model	Prediction
Sri Lanka	U850	- above normal in central area - close to normal in the north
	SST	normal to slightly above normal
Seychelles	U200	above normal
Tanzania	U200	close to normal
	SST	above normal
Comoros	SST	- below normal in Moroni - close to normal in Hahaya
	U_850	close to normal in both stations (Moroni and Hahaya)
	V_850	close to normal in both stations
Madagascar	SST (4 domains)	normal to above normal in all areas
Mauritius	SST (2 domains)	normal to below normal
La Reunion	SST	NBJRR10: below normal in both SW and NE areas
	U850	NBJRR10: below normal in both SW and NE areas
	U200	RR: normal to below normal in SW

ANNEX 1: SWIOCOF PROGRAMME

PRE-FORUM

Monday 24 September

Morning

9:00 – 9:15	Welcome of participants
9:15 – 9:30	Opening – Presentation of all participants in turn
9:30 – 9:45	Organisation, objectives, schedule and expected results

Session 1: Panorama of Seasonal Outlook, Local Context Assessment in Terms of Rainfall, Expectations from the Forum – Country Presentations

9:45 – 10:00	Comoros Presentation

10:00 – 10:15 Coffee Break

10:15 – 10:30	Madagascar Presentation
10:30 – 10:45	Mauritius Presentation
10:45 – 11:00	Reunion Presentation
11:00 – 11:15	Seychelles Presentation
11:15 – 11:30	Tanzania Presentation
11:30 – 11:45	Sri Lanka Presentation

Afternoon

Session 2: Introduction to Seasonal Forecast Methods

2:00 – 2:30	Usual seasonal forecast downscaling methodology (JP Céron)
2:30 – 3:15	Statistical notions applied to seasonal forecast (JP Céron)

3:15 – 3:30 Coffee Break

3:30 – 4:15 Presentation of data sets used (F. Bonnardot)

4:15 – 5:00 Introduction to CPT software use (JP. Céron, F. Bonnardot)

Tuesday 25 September

Morning

Session 3: Influence of Large-scale Forcing in the SWIO Area

8:30 – 9:00 Regional large-scale climatology, specific features of the period under study (OND)

9:00 – 10:00 Analysis of GPCP regional rainfall data (importation into CPT, regional scale variability mode analysis, representativeness in connection with local series, etc.)

10:00 – 10:15 Coffee Break

10:15 – 12:00 Identification of large-scale variability sources (SST, Action Centres, etc.), links between those variability modes (ACP, CCA, Composites, etc.) studied in practical sessions

Afternoon

2:00 – 3:15 Identification of large-scale variability sources (cont'd)

3:15 – 3:30 Coffee Break

3:30 – 5:00 Links between identified large-scale variability modes and regional precipitations

Wednesday 26 September

Morning

Session 4: Predictability Linked to Oceanic Forcing

8:30 – 10:00 Links between main oceanic variability modes (ENSO, IOD, other modes in the IO, etc.) and regional/local precipitation series (statistical model scores, etc.)

10:00 – 10:15 Coffee Break

10:15 – 12:00 Practical session cont'd → Identification of the most "predictable" areas in the region and of those which do not respond to oceanic signal; additional study projects for the latter (Weather type patterns, etc.)

Afternoon

2:00 – 3:15 Presentation of Weather Type pattern research done by DIRRE – Manipulations with CPT to analyse the potential of such approach

3:15 – 3:30 Coffee Break

3:30 – 5:00 **Recap of Sessions 3 and 4 on the basis of a summary prepared by each country**

Thursday 27 September

Morning

Session 5: Exploitation of Seasonal Forecast Dynamic Models (Hindcast ARPEGE - Climat V3)

8:30 – 10:00 Model's capacity to reproduce large-scale variability modes (SST, Atmospheric Fields, etc.) (Hindcast / ERSST or ERA-Interim)

10:00 – 10:15 Coffee Break

10:15 – 12:00 Practical session cont'd

Afternoon

2:00 – 3:15 Assessment of raw rainfall predictions (Hindcast / GPCP or local series)

3:15 – 3:30 Break

3:30 – 5:00 **Recap of Sessions 3, 4 and 5 → Strategy decision for OND 2012 outlook**

Friday 28 September

Morning

Session 6: Putting Strategy into Practice to Determine Consensual Forecast

8:30 – 10:00 SST-based forecast (ARPEGE-V3 or SST indices fields)

10:00 – 10:15 Coffee Break

10:15 – 12:00 ARPEGE-Climat V3-based forecast (precipitations or large-scale indices, weather type patterns, etc.)

Afternoon

2:00 – 3:15 Finding a consensus on OND 2012 outlook

3:15 – 3:30 Coffee Break

3:30 – 5:00 **Recapitulation and data preparation for the 1-2 October Forum**

FORUM

Monday 1st October

Morning

8:30 – 9:00 Welcome of participants

9:00 – 9:30 Opening speeches

9:30 – 9:50 Presentation of GFCS (Global Framework for Climate Services): Mr Kolli, WMO

9:50 – 10:10 Presentation of seasonal prediction in India: Dr A. Suryachandra Rao, IITM

10:10 – 10:30 Coffee Break

Session 1: General Considerations on Seasonal Forecast

10:30 – 11:15 Presentation (30’) + Questions (15’): What is Seasonal Forecast?

11:15 – 12:00 Presentation (30’) + Questions (15’): Use of Seasonal Forecast

Afternoon

Session 2: Pre-Forum Work Sessions Report

2:00 – 2:15 Description of methodology

2:15 – 2:35 Presentation of large-scale forecast

2:35 – 2:45 Presentation of consensual regional forecast

2:45 – 3:15 Questions – Debate

3:15 – 3:30 Coffee Break

3:30 – 4:30 Country presentations: OND 2012 Outlook

4:30 – 5:00 Questions – Debate

Tuesday 2 October

Morning

Session 3: Impact per Activity Sector

9:00 – 10:30 Presentations by users' representatives: Impact according to seasonal deadlines

10:30 – 11:00 Coffee Break

10:30 – 12:00 Presentations cont'd → Debate on potential impacts of forecast in various sectors – The relevant indicator issue

Afternoon

2:00 – 3:00 Presentation and debate on further action in line with the SWIOCOF process

3:15 – 3:30 Coffee Break

3:30 – 5:00 Summary – Closing – Press Point

ANNEX 2: LIST OF PRESENTATI0NS

P R E - F O R U M:

Session 1

- Country Presentations: National Contexts of Seasonal Prediction (Representatives from Meteorological Services)

Session 2

- Notions of Climatic Downscaling (J.P Céron, MF)
- General Introduction to Statistical Models for Seasonal Prediction (J.P Céron, MF)
- Statistical Tools: Principal Component Analysis (PCA) and Canonical Correlation Analysis (CCA) (J.P Céron, MF)
- Presentation of Data Sets (F. Bonnardot, MF)

Session 3

- Large-scale Climatology in the SWIO Area (F. Bonnardot, MF)

F O R U M

Introduction

- Presentation of GFCS (J.P Céron, MF)
- Presentation of Seasonal Forecast in IITM (India) (Suryachandra A. Rao, IITM)

Session 1

- General Presentation: What is Seasonal Forecast? (J.P Céron, MF)
- Use of Seasonal Forecast (J.P Céron, MF)

Session 2

- Pre-Forum Methodology (F. Bonnardot, MF)
- Large-scale OND 2012 Outlook (J.P Céron, MF)
- Regional Consensual OND 2012 Outlook (F. Bonnardot, MF)
- Presentation by each Country: National Predictions (Representatives from Meteorological Services)

Session 3

- An example of Seasonal Forecast Operational Application in West Africa: Management of the Manantali Dam on the Senegal River (J.P Céron, MF).
- How Seasonal Forecast can Contribute to Preventing Vector-borne Diseases in Reunion Island (JS Dehecq, ARS-OI – Reunion)