SWFDP REGIONAL SUBPROJECT IN RA I

QUARTERLY PROGRESS REPORT N° 1
for the period 6 November 2006 – 28 February 2007

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1 – Introduction

1.1 – This report summarizes the feedback from the participating NMHSs in the SWFDP Regional Subproject in RA I (South-eastern Africa) during the first quarter of the demonstration phase (6 November 2006 to the 28 February 2007). It is based on three main sources of information:

- the "Daily Guidance" bulletins issued by RSMC Pretoria, including probability tables for medium-range (days 3-4-5) and risk table for short-range (days 1-2);

- various information that was made available at the mid-point of the peak severe weather season at the meeting of SWFDP Regional Subproject Management Team that took place in Maputo late February 2007;

- the quarterly progress reports provided by the NMHSs participating in the SWFDP Regional Subproject (Botswana, Madagascar, Mozambique, Tanzania and Zimbabwe) according to the guidelines agreed during the Maputo's meeting.

1.2 – The presentation format of the Daily Guidance, the event evaluation form, and the template of the quarterly progress report were all adopted by the SWFDP Regional Subproject Management Team, and can be found in a companion document to this report entitled "Principles for the evaluation of the SWFDP Regional Subproject in RAI".

1.3 – The information provided by the participating centres has been analysed with the aim to assess and guide the improvement of the utility and quality of the Daily Guidance, the relevance and the skill of the various NWP products, the pertinence of the severe weather warnings issued by the NMHSs and the improvement of the service they deliver to Disaster Management and Civil Protection Authorities, "DMCPAs".

2 – Summary of the Severe Events reported from the NMHSs

2.1 – Over the relevant geographical area (south-eastern Africa and western Indian Ocean), this first quarter of the demonstration period has been dominated by passages of topical lows or tropical cyclones that effectively hit several countries involved in the SWFDP Regional Subproject and caused major damage. It is also clear that this type of meteorological situation was also favourable to the development of instabilities that produced convective events such as precipitation giving flash floods or destructive wind gusts.

2.2 – Table 1-a and Table 1-b show the periods when severe heavy precipitation and strong winds have been recorded by each of the NMHSs for their respective countries. (See explanations of the annotations in the following paragraph 2.3.)

Heavy Precipitation										
Botswana		Madagascar		Mozambique		Tanzania		Zimbabwe		TC
from	to	from	to	from	to	from	to	from	to	
						07/11/06				
		11/11/06	12/11/06							
13/11/06*				**13/11/06**						
								14/11/06*		
15/11/06*										
17/11/06*										
18/11/06								**18/11/06**		
		20/11/06								
22/11/06										
		25/11/06	29/11/06	**29/11/06**				**25/11/06***		Anita
		01/12/06								
						03/12/06				
		05/12/06								
		07/12/06	08/12/06							
		10/12/06	13/12/06					**10/12/06**		
								11/12/06*		
				12/12/06*				**11/12/06***	**12/12/06***	
						13/12/06				
		15/12/06	16/12/06							
		17/12/06				17/12/06		17/12/06*		
				18/12/06*						
								19/12/06*		
				21/12/06*		**21/12/06**	**23/12/06**			Bondo
								25/12/06*	26/12/06*	
								28/12/06		
29/12/06		29/12/06	30/12/06			**29/12/06**				
30/12/06										
								31/12/06		
								31/12/06	**01/01/07**	
				01/01/07						
				02/01/07				**02/01/07***		Clovis
		03/01/07		**03/01/07**						
		03/01/07	**05/01/07**	**04/01/07**						
		06/01/07	08/01/07	**08/01/07***						
		10/01/07	17/01/07	**10/01/07***	**11/01/07***					Enok
				12/01/07*						
								16/01/07		
17/01/07*										
		19/01/07	22/01/07	20/01/07*				**20/01/07***	**21/01/07***	
				21/01/07*						
								23/01/07*		
		24/01/07	26/01/07					25/01/07*		
		28/01/07	04/02/07					29/01/07*		
								30/01/07*		
				03/02/07*						
06/02/07		06/02/07	14/02/07					**07/02/07***		
				14/02/07						
		17/02/07						**17/02/07***		
								18/02/07*		Favio
								21/02/07*		
		22/02/07	23/02/07					**22/02/07***		
								23/02/07*		
								25/02/07*		
		26/02/07	27/02/07							Gamède

Table 1-a: Recorded heavy precipitation according to the NMHSs reports.

Strong Wind										
Botswana		Madagascar		Mozambique		Tanzania		Zimbabwe		TC
from	to	from	to	from	to	from	to	from	to	
		none	none	12/11/06*				none	none	
13/11/06										
				14/11/06						
15/11/06										
22/11/06										
				29/11/06						Anita
				12/12/06*						
						21/12/06	**23/12/06**			Bondo
				01/01/07						Clovis
				08/01/07						
						11/01/07				Enok
				12/01/07						
27/01/07*										

Table 1-b: Recorded strong winds according to the NMHSs reports

2.3 – Comments on the interpretation of Table 1-a and Table 1-b.

- The event periods listed in Table 1-a and Table 1-b are not mutually exclusive; some periods recorded both heavy precipitation and strong winds.

- A "*" annotates the date when the NMHS indicated that the phenomenon is estimated as very localized/mesoscale or from convective origin (note that NMHS Madagascar and Tanzania did not make this kind of distinction).

- As the instructions about taking into account severe weather associated with tropical cyclones were not very clear, it is not sure that all the severe weather events were recorded. (NMHS Mozambique in particular did not mention these events).

- An examination of the synopsis text that accompanied the short-range guidance issued from RSMC Pretoria during the critical periods shows that many of them are linked to the presence of tropical lows or tropical cyclones over or influencing the Regional Subproject area. Indeed 6 tropical cyclones were identified and tracked by the RSMC La Réunion during this first quarter. The threatening periods for the countries involved in the SWFDP, which have been obtained with help of the definitive tracks established by RSMC La Réunion (see Annex 1 to this document), are given below:

  Anita: 29/11/06 – 04/12/06,
  Bondo: 21/12/06 – 28/12/06,
  Clovis: 02/01/07 – 04/01/07,
  Enok: 09/02/07 – 13/02/07,
  Favio: 18/02/07 – 23/02/07,
  Gamède: 19/02/07 – 28/02/07.

- The beginning of the threatening period related to tropical cyclones is also indicated in the last column of Table 1-a and Table 1-b.

- The dates of the events for which a **warning was issued** from the NMHS are written in bold characters.

- The events which have been chosen as case studies by the NMHS are highlighted by circling the corresponding date or period in a rectangle.

3 –Evaluating the performance of warnings

3.1 – The common way to evaluate the performance of a warning system is based on the 2 x 2 contingency table matrix including the number of justified warnings ("hits") A, the number of missed severe events B and the number of false alarms C. The POD index (Probability of Detection) is defined as the ratio of the number of hits by the total number of severe events, i.e., A/(A+B) ; the FAR (False Alarm Ratio) is defined as the ratio of the number of false alarms by the number warnings issued, i.e., C/(A+C).

3.2 – The information contained in Table 1a and Table 1 b could in principle allow us to calculate these two indices. However, it is felt that the information base could be incomplete. Therefore their interpretation has to be made with caution. Indeed it is difficult to define and determine objectively what is the occurrence of a severe weather event. Should it only be based on locally recorded amounts of precipitation and wind gusts? In addition, the decision to issue a warning not only depends on the anticipated intensity of the event but also on the expected impacts and consequences for life and property.

3.3 – Since no false alarms were reported by NMHSs it could be concluded that the FAR was 0, meaning their performance was perfect from this angle (The NMHSs were asked to submit an event evaluation for both forecasted and actual severe weather events, however very few event evaluation reports were submitted.). On the other hand Table 1-a and Table 1-b allow us to compute the POD for each of the NMHSs but it would be unjustified to rate their performances based on the POD values alone, taking into account the diversity of the practices and standards relative to the issuing of warnings.

3.4 – The project should encourage ~~the~~ NMHSs to maintain their respective records of warnings issued, criteria used for warnings, and verification data to implement a reliable warnings verification programme.

4 – The performance of warnings issued from the NMHSs

4.1 – NMHS Botswana

Botswana reported 10 severe weather events: 6 corresponded to heavy precipitation, 1 to strong winds and 3 to both; among these events 4 have been identified as resulting from localized convective activity and 3 of them lead to damage to houses. Nevertheless most of the heavy rainfall did not result in floods because the affected surfaces were very dry before the event. Only 2 warnings were issued by NMHS Botswana corresponding to synoptic severe weather events (22/11/06 and 29/12/06). According to these data the calculated POD is 2/10 = 0.2. As its case study, NMHS Botswana showed the severe weather event on 13/11/06 characterized by strong winds linked to intense convective activity. This situation should interest the modellers because all the models well forecast heavy precipitations but totally failed to forecast strong destructive winds which razed 12 villages, damaged power lines and uprooted trees.

4.2 – NMHS Madagascar

Madagascar reported 21 severe weather events or periods corresponding to heavy precipitation but did not indicate whether they were from convective origin or not; among these events or periods 7 of them lead to floods. Warnings have been issued only for the period 03/01/07-05/01/07 when the Tropical Cyclone Clovis hit the western coast of

Madagascar. The calculated POD is 1/21 = 0.04 but this small value could be a result of a locally adopted policy relative to the issuing of warnings.

~~Nevertheless~~ Madagascar mentioned serous problems of Internet connectivity which really prevented this NMHS from using updated guidance and products implemented in the framework of the SWFDP Subproject. It is possible that through most of this first period of demonstration, Madagascar had not been able to access the available products. As its case study, NMHS Madagascar proposes the period 03/01/07-05/01/07 already mentioned above, which resulted in the issuing of a warning.

4.3 – NMHS Mozambique

Mozambique reported 18 severe weather events not associated with tropical cyclone: 11 corresponded to heavy precipitation, 2 to strong winds and 5 to both; among all these events, 11 have been identified as resulting from localized convective activity. Furthermore Mozambique suffered the effects of the Tropical Cyclone Favio that devastated the town of Vilankulo and some other places on the 22-23 February 2007. 11 warnings have been issued from NMHS Mozambique, 7 of them corresponding to synoptic severe weather events (13/11/06, 29/11/06, 01/01/07, 02/03/07, 03/01/07, 04/01/07, 14/02/07). 4 severe events that lead to damages were not covered by warnings and especially the severe episode observed in Quelimane (20-21/01/07) which completely flooded this city. By taking into account all the reported severe events the POD is 11/18 = 0.61. The Quelimane episode is proposed as a case study by NMHS Botswana: The meteorological situation was characterized by an upper level trough associated with a cut-off low, which enhanced the connection between the ITCZ and the cold front, giving heavy rain. Unfortunately none of the models used predicted the right amount of rainfall, nor did the RSMC-Pretoria Daily Guidance.

4.4 – NMHS Tanzania

Tanzania reported 7 severe weather events: 5 corresponded to heavy precipitation and 1 to strong winds while 1 severe weather period with thunderstorms and strong winds (21-23/12/06) was associated with the Tropical Cyclone Bondo. 4 warnings were issued from NMHS Tanzania for the events which resulted in floods (13/12/06, 17/12/06, 21-23/12/06, 29/12/06) so that the calculated POD is 4/7 = 0,57. Nevertheless no warning was issued for the strong winds event which uprooted many houses in Mwanza (11/01/07). As its case study, NMHS Tanzania proposed the situation of the 29/12/06 which resulted in heavy precipitation which flooded many streets in Dar-es-Salam.

4.5 – NMHS Zimbabwe

Zimbabwe reported 26 heavy precipitation severe events but only 6 of them corresponded to synoptic scale phenomena. Among the 17 events coming from localized convective activity 2 of them lead to significant damage (12 villages ruined on the 11/12/06, some houses flooded in Harare during the period 11-12/12/06). 18 warnings have been issued from NMHS Zimbabwe, 5 of them corresponding to synoptic severe weather events (10/12/06, 28/12/06, 31/12/06, 31/12/06-01/01/07, 07/02/07). According to these results the calculated POD is 18/26 = 0.69. As its case study NMHS Zimbabwe proposes the period 21-24/02/07 characterized by the arrival of the Tropical Cyclone Favio and the resulting heavy precipitation.

5 – Summary of RSMC Pretoria Daily Guidance for Severe Weather Events

5.1 – The demonstration phase began on the 6 November 2006 but archived guidance from RSMC Pretoria is available from the 16 November 2006 only, due to start-up problems. The period that is examined is from the 16 November to the 28 February 2007.

5.2 – An examination of the forecasting of severe weather episodes during this first quarter is summarized by the short-range risk table and the medium-range probability table that comprise the Daily Guidance issued by RSMC Pretoria. The Tables 2-a and 2-b concern heavy precipitation. Table 2-a summarizes the number of days when medium or high risk were predicted in the RSMC regional short-range guidance and Table 2-b summarizes the number of days when medium or high probability of occurrence were predicted in the RSMC medium-range guidance. Table 3-a and Table 3-b summarize the guidance for predictions of strong wind.

Number of days when medium or high risk of heavy precipitation were notified in the RSMC regional short range guidance				
Country	Day 1 Risk		Day 2 Risk	
	Med.	High	Med.	High
Botswana	0	0	0	0
Madagascar	41	40	41	33
Mozambique	26	13	22	9
Tanzania	18	3	15	2
Zimbabwe	8	5	4	3

Table 2-a.

Number of days when medium or high probability of heavy precipitation were notified in the RSMC regional medium range guidance						
Country	Day 3 Probability		Day 4 Probability		Day 5 Probability	
	60 %	80 %	60 %	80 %	60 %	80 %
Botswana	2	0	2	0	3	0
Madagascar	38	22	45	8	28	4
Mozambique	21	3	21	0	14	1
Tanzania	11	0	5	0	6	0
Zimbabwe	8	2	5	2	1	0

Table 2-b.

Number of days when medium or high risk of strong wind were notified in the RSMC regional short range guidance				
Country	Day 1 Risk		Day 2 Risk	
			Med.	High
Botswana	0	0	0	0
Madagascar	28	17	28	18
Mozambique	16	5	14	4
Tanzania	1	0	2	0
Zimbabwe	2	0	1	0

Table 3-a.

Number of days when medium or high probability of strong wind were notified in the RSMC regional medium range guidance						
Country	Day 3 Probability		Day 4 Probability		Day 5 Probability	
	60 %	80 %	60 %	80 %	60 %	80 %
Botswana	0	0	0	0	1	0
Madagascar	19	12	26	3	22	2
Mozambique	8	2	6	0	6	1
Tanzania	0	0	1	0	1	0
Zimbabwe	0	0	0	0	0	0

Table 3-b.

5.3 – An examination of these tables shows that heavy precipitation periods were predicted mainly over Madagascar and Mozambique and at a lesser degree over Tanzania and Zimbabwe; only low probability was predicted for Botswana. Concerning strong winds events, the situation is similar but the number of risky days is less important.

5.4 – Another approach is to list the periods for which severe weather was predicted in this first quarter of the demonstration phase. Table 4-a and Table 4-b list these critical periods based on the short-range RSMC Daily Guidance i.e. from the point of view of the forecaster at RSMC Pretoria, for heavy precipitation and strong winds respectively.

Heavy Precipitation		high risk forecast							
Botswana		Madagascar		Mozambique		Tanzania		Zimbabwe	
from	to	from	to	from	to	from	to	from	to
none		27/11/06	28/11/06						
				30/11/06	**01/12/06**				
		01/12/06	02/12/06						
		20/12/06	**08/01/07**	**30/12/06**	**02/01/07**			**31/12/06**	**01/01/07**
		20/01/07							
		27/01/07							
		29/01/07							
		05/02/07	**14/02/07**	**11/02/07**	**13/02/07**	05/02/07	07/02/07	13/02/07	
		16/02/07							
				19/02/07					
		20/02/07	**21/02/07**						
				22/02/07	**23/02/07**			**23/02/07**	
		25/02/07	**28/02/07**	**25/02/07**	**26/02/07**			26/02/07	

Table 4-a: High risk heavy precipitation events according to RSMC Daily Guidance.

Strong Wind		high risk forecast							
Botswana		Madagascar		Mozambique		Tanzania		Zimbabwe	
from	to	from	to	from	to	from	to	from	to
none		01/12/06		**30/11/06**	**01/12/06**	none		none	
		23/12/06	**26/12/06**						
		31/12/06	**04/01/07**	01/01/07	02/01/07				
		08/01/07							
		20/02/07	**21/02/07**						
		23/02/07							
		25/02/07	**28/02/07**						

Table 4-b: High risk strong wind events according to RSMC Guidance.

5.5 – In order to assess the efficiency of the medium-range guidance some additional information is also given on the Tables 4. When the severe weather forecast events/periods have been announced in the medium range guidance with a probability of occurrence between 60% and 80% the dates are written in bold characters; when they have been announced in the medium-range guidance with a probability of occurrence greater than 80% the dates are in bold characters underlined. An examination of these tables shows that for a total number of 30 severe weather forecast events/periods given by the guidance 22 were announced in the medium-range guidance with a probability of occurrence greater than 60%.

5.6 – A quick comparison between Tables 1 and 4 is rather disconcerting because it is difficult to see a clear correspondence between predicted high risky periods and actual severe weather events. As it will be explained, many of the severe weather events corresponded to localized convective events that were not caught by NWP models nor taken into account in the RSMC Daily Guidance.

5.7 – Although Tables 3 and 4 contain information that could be used to assess roughly the relevance of the Daily Guidance Product for the NMHSs, it would be difficult or inappropriate to calculate POD and FAR parameters. Indeed these indices relate to an event which occurs (or not) at a given date at a given place so that a quantitative evaluation of the value of the Daily Guidance by means of POD and FAR would require detailed analysis of the forecasts for the various lead- times jointly with the observed weather. The “event evaluation form” has been developed by the Regional Subproject Management Team for this purpose, and this form has to be filled diligently and for every forecast or observed severe weather event.

5.8 – The NMHS were asked to assess the usefulness of the RSMC Daily Guidance by giving a mark ranking from 1 to 4 (according respectively to indicate “misleading”, “not useful”, “useful” and “very useful” for each severe weather event. A few remarks are necessary to interpret correctly Table 5:

- the row “unavailable information” corresponds to the events whose usefulness is not specified in the report;
- in the line corresponding to “misleading information” the number of events corresponding to convective/mesoscale events is indicated within parenthesis;
- the question mark within parenthesis indicates that the information is questionable and clarification is required;
- the percentage of “useful to very useful information”, in the bottom row, is calculated by taking into account only those events whose information about usefulness of the guidance is given; the percentages given within the parenthesis are obtained when localized convective/mesoscale events are excluded.

Value of the Daily Guidance	Botswana	Madagascar	Mozambique	Tanzania	Zimbabwe
Total number of events	10	21	18	7	26
Unavailable information	1	0	0	3	0
Misleading	5(4c)	21 (?)	7(6c)	0	0
Not useful	0	0	1	1	6
useful	0	0	2	3	6
Very Useful	4	0	8	0	14
% Useful-Very useful	44% (80%)	0% (?)	55% (83%)	75%	71%

Table 5 : Value of the RSMC Daily Guidance according to reports from NMHSs

5.9 – An examination of the Table 5 shows the usefulness of the RSMC Daily Guidance to forecast severe weather events. Indeed, if we exclude convective/mesoscale events the percentage of useful to very useful guidance becomes greater than 70%, except for Madagascar. (Note: Madagascar reported that Daily Guidance was most of the time unavailable at the NMC and not “misleading guidance”.) This result is entirely consistent with the descriptive reports from the NMHSs regarding the difficulty that NWP guidance had to predict localized, sudden onset type of convective events.

6 – General Comments about the Products

6.1 – Usefulness of RSMC Daily Guidance

6.1.1 – The NMCs that used the RSMC Pretoria Daily Guidance are generally very satisfied with this product, which is very useful to help forecasters issue warnings and reinforce their confidence in their own forecasts. It is important to note that this guidance is not only used in the context of severe weather forecasting but also quite useful for the day-to-day routine forecasting.

6.1.2 – The criticism essentially ~~turns~~ is directed to ~~on~~ the lack of useful information to forecast very localized strong winds or heavy precipitation events; this problem is the consequence of the inability of the NWP model to catch such small scale phenomena**.**

6.1.3 – From the point of view of RSMC Pretoria, there is still room for improvement of the narrative story prepared by the forecaster, especially to ensure the consistency between the forecast prepared by successive forecasters.

6.1.4 – The Daily Guidance could be improved on an ongoing basis if timely feedback was to be provided by the participating NMHSs to RSMC Pretoria. Over time and severe weather cases, RSMC Pretoria forecasters will gain in understanding and better recognize patterns that are associated with heavy rainfall and strong winds over the entire southern Africa region.

6.2 - Usefulness of SWFDP NWP/EPS Products and RSMC UM-SA12

6.2.1 – A large spectrum of deterministic and probabilistic NWP model products are made available via Internet accessible Web sites to the NMC's. It is clear that for most of NMCs, the generally limited bandwidth of their Internet connection limits their access to the large variety of products. That is the reason why it is important that RSMC Daily Guidance points to the most relevant fields to be scrutinized for a given severe weather event. Generally all these products are really useful for the forecasters in the NMCs even if the actual weather does not occur according to that predicted by the guidance especially for small scale severe events.

6.2.2 – Concerning the global centers, ECMWF's products seem to be thought of as more skilful than NCEP's ones for the forecasters in Zimbabwe.

6.2.3 – The UM-SA12 fine mesh products are very appreciated in Mozambique, and their use should become routine in Botswana during the second quarter of the demonstration phase. Madagascar consistently noted the UM SA12 was in the "misleading" category. This feedback needs to be further investigated and clarified.

6.2.4 – The stability indices are generally useful in order to delineate potentially convective areas where some local severe phenomena are likely to occur.

6.2.5 – Finally the forecasters are very satisfied with the clear information contained in the EPSgrams, particularly because this product indicates an outlook (lead-time), forecasting out to day-10, especially noted by Zimbabwe.

7 – Project evaluation against SWFDP goals

7.1 - To improve the ability of NMCs to forecast severe weather events: All the participating NMHSs noted a positive impact of daily use of SWFDP products (both RSMC Daily Guidance and NWP outputs) which allow forecasters to get a better detailed view about the meteorological situation and helps increase their confidence.

7.2 – To improve the lead-time of alerting these events: All the NMHSs report that a consequence of the implementation of the SWFDP Regional Subproject is a substantial increase of the lead-time for alerting to severe weather events. Several NMHSs are now able to issue pre-warning 5 days ahead and this advance gives more time for preparing arrangements to try to mitigate the possible effects of severe weather. This improvement of the lead-time has been particularly beneficial to manage the situation created by heavy precipitation giving floods and by the Tropical Cyclone Favio in Mozambique.

7.3 – To improve the interaction of NMHSs with DMCPAs before, during and after severe weather events: The SWFDP Regional Subproject has given the opportunity to strength the links with the DMCPAs that gave a very positive feedback. In Mozambique a systematic briefing is organized each time severe weather event is expected and meteorologists can be attached for a time to DMCPA to help them to closely follow the meteorological situation. This increased cooperation also allowed to detect the gaps for improvement in the transmission of the information between these services and toward the public, and to point out the need to involve all concerned services (health service, for example).

7.4 – To identify gaps and areas for improvements: All the NMHSs noted under this item the difficulty to get accurate guidance to forecast exact location and intensity of severe convective events, which is the consequence of the inability of NWP models to resolve explicitly such small scale, as indicated in the following item.

7.5 – To improve the skill of products from Global Centres through feedback from NMCs: All the NMHSs have pointed out the weakness of the NWP model products to forecast the right amount of precipitation even when there are originated from to large scale processes. Of course this shortcoming is more marked for localized convective events associated with heavy precipitation giving flash floods, or damaging wind gusts. These phenomena are not presently well treated by the NWP models. Forecasters nevertheless could use diagnostic methods such as the stability indices to identify areas of high risks of localized deep or severe convection.

8 – Evaluation of weather warnings

8.1 - Feedback from the public: The feedback from the public is not easy to assess due to a general lack of a regular mechanism of evaluation. Overall the NMHSs noted that the public gives positive feedback (when the formulation of the warnings is not too “technical”) and appreciates the increasing lead-time of the warnings. Nevertheless as they do not know what are the limitations of NWP they do not well understand why there are failures in predicting heavy precipitation of strong winds due to mesoscale convective type of events.

8.2 – Feedback from DMCPAs: There is no systematic feedback in all the countries but generally national DMCPA noted improvement in the timeliness and the relevance of the information provided by NMHS. This really contributed to increase the credibility of forecasts issued by the NMHSs. In Zimbabwe, for example, DMCPA service appreciated the advices issued when the Tropical Cyclone Favio struck. Nevertheless DMCPA services are not happy with the missed events and would like an increased lead-time to be able to better prepare protection or rescuing measures.

8.3 – Feedback from the media: The implementation of the SWFDP Regional Subproject and the increased credibility of the forecasts favoured a systematic distribution of the information toward the public through the various media. The media appreciated the warnings but remained sceptical about the capabilities of the meteorological science when events like very strong local destructive winds were totally missed. There is also a tendency of the journalists to exaggerate or to extrapolate what the forecasters are saying: this is the reason why it is necessary to establish a dialog between meteorologists and journalists in order to better inform them of the limitations of the weather forecasts, especially for the convective events.

8.4 – Verification by the NMCs: The verification of the warnings which has to be undertaken by the NMHSs is often problematic due to the difficulties in acquiring reliable observations and damage information. It is often difficult to access and survey affected areas away from meteorological stations. Generally all the NMHSs agree that the cascading process implemented in the framework of the SWFDP Regional Subproject demonstrated its efficiency to forecast heavy precipitation due to synoptic phenomena, even if the rainfall amount are often underestimated. Due to the involvement of RSMC La Réunion the system also demonstrated its usefulness to provide confident information about the tracks of tropical cyclones that are likely to affect countries in south-eastern Africa and western part of Indian Ocean. Nevertheless, the efficiency of the system to forecast strong winds (often associated with mesoscale convective events) is more questionable. Despite the availability of various stability indices given by NWP models, forecasting the exact location of this kind of event remains difficult.

9 - Conclusions

9.1 –The general feedback from the NMHSs is very positive in several aspects. The actual implementation and execution of the demonstration allowed fine tuning of the Implementation Plan to optimize the potential benefits from the project.

9.2 – During this first quarter, 6 tropical cyclones travelled over the Regional Subproject region giving heavy precipitation and strong winds in several countries. RSMC La Réunion provided their usual specialized forecast products related to tropical cyclones, including to the SWFDP. RSMC Pretoria incorporated all available information, including that from RSMC La Réunion, to produce the Daily Guidance covering the entire southern African region, and for all heavy rainfall and strong wind events predicted to exceed the criteria adopted for the SWFDP.

9.3 – It is necessary to improve the feedback from NMHSs, i.e., it has been very difficult to obtain from the NMHS after each observed severe event the event evaluation form designed to be used to regularly assess the efficiency of the Daily Guidance issued from RSMC Pretoria. The Regional Subproject Management Team agreed that its simplified format should help gather relevant information about the individual events. The lack of such returns could indicate that, during severe weather periods forecasters are simply too busy to fill in immediately such event evaluation forms. However, ~~without~~ it is only with this information that it is possible ~~, it is difficult~~ to estimate objective measures of quality (FAR and POD), and their tendency over time.

9.4 – During the RSMT meeting in Maputo almost all the NMHSs (except Botswana) reported that they had encountered difficulties to access NWP model outputs (images) through the SWFDP Web portal implemented at RSMC Pretoria. Even problems with e-mail and power supply were mentioned. There is no doubt that the RSMC Daily Guidance, which is a key product, should be sent to the NMCs by using several means, such as by satellite broadcast, to assure earliest availability to the forecasting centres.

9.5 – All the NMHSs agreed that the implemented SWFDP cascading process is particularly efficient to improve forecasts and increase the confidence of the forecaster in case of heavy precipitation at the synoptic scale, even if rainfall amounts are often underestimated. Accurate forecasts of the location and intensity of heavy precipitation and strong winds resulting from convection remain difficult with presently available NWP tools. Forecasting severe convective events with a few hours of lead-time is one of the goals of “nowcasting” methods, using radar and satellite data processing and images. Perhaps high resolution and high frequency satellite-based products could be implemented and used to help track and forecast such mesoscale systems.

9.6 – The verification of the guidance, forecasts and warnings against actual occurrence of severe weather is often difficult because relevant meteorological observations or damage reports are often not available, incomplete, or only subjective. Special satellite product such as the ones provided by the EUMETsat Satellite Application Facilities (SAF) could help evaluate rainfall amounts.

9.7 – With their quarterly reports, the NMHSs are requested to prepare case studies and to archive in several places the complete documentation (relevant NWP fields, satellite images, warnings, and observations). This material are being considered for use in training sessions, and is very important for the modellers who can use these test cases to run improved models. It is not clear at this time how much or how completely have relevant data and products been archived.

9.8 – Finally it is abundantly clear that all the NMHSs involved in the SWFDP Regional Subproject in south-eastern Africa want to continue to use the products that have been implemented in the SWFDP framework of the cascading process after the completion of the demonstration phase (i.e. November 2007). NMHSs need to continue to work with the DMCPAs to ensure that the forecasting and warning services meet the requirements, and to sustain and continue to improve these services by operationally implementing the SWFDP, beyond the demonstration phase.

9.9 – It has been noted by RSMC Pretoria that only little feedback is received in real time from the NMCs by using the “Severe weather Evaluation Form” developed by the SWFDP Regional Subproject Management Team (available on the Supbproject website). Moreover it has been very difficult to collect in due time the quarterly reports from the NMHSs. It is necessary to recall that routine and periodic feedback is essential for preparing an efficient evaluation of the Subproject and then to ensure its sustainability beyond the end of the demonstration phase.

Annex 1 – Trajectories of tropical lows and tropical cyclones over the south-western Indian Ocean during the cyclonic season 2006-2007 (origin: RSMC La Réunion)

N°	Nom du système
15	15-20062007
14	JAYA
13	13-20062007
12	INDLALA
11	HUMBA
10	GAMEDE
09	FAVIO
08	ENOK
07	DORA
06	06-20062007
05	CLOVIS
04	04-20062007
03	BONDO
02	ANITA
01	01-20062007