Issue 3/ 2012

DROUGHT PREDICTABILITY!

Dear Reader,

Welcome to this third issue of the DEWFORA newsletter.

DEWFORA is about improving drought early warning and forecasting to strengthen preparedness and adaptation to droughts in Africa.

Vast parts of Africa rely on the rainy season for livestock and agriculture. Droughts can have a severe impact in these areas, which often have a very low resilience and the capabilities to mitigate their effects are limited. Effective mitigation can be achieved through the proper utilization of seasonal forecasts which predict future climate up to 6 month in advance. As the global leader in providing medium range weather forecasts, ECMWF is pre-dominantly interested in meteorological droughts (driven by precipitation anomalies) and their predictability. Therefore, within DEWFORA and together with its partners, ECMWF has assessed the predictive capabilities of an integrated drought monitoring and forecasting system for seasonal forecasts.

Although global forecasts and evaluations can be performed, local knowledge is important. Therefore, the evaluation has so far been based in four basins in Africa: the Blue Nile, Limpopo, Inner Niger Delta (DEWFORA case studies), and Upper Zambezi. ECMWF demonstrated that its seasonal forecasts have a higher reliability and skill in the Blue Nile, Limpopo and Upper Niger than in the Zambezi. This skill and reliability depends strongly on the temporal scale of droughts as more skill is observed at larger time-scale (meaning that drought signals accumulated over a longer time period are predicted with higher skill). The ECMWF seasonal forecast system has predictive skill which is higher than using climatology for most regions, and will always be at least as good as a guess based on climate averaging - but gives you the chance to be better. ECMWF seasonal forecasts will always be at least as good as a guess based on climate averaging - but gives you the chance to be better. This issue of the newsletter reports on stakeholders meeting in the Niger, Regional Drought analysis in The Limpopo, as well as downscaled and tailor made models for the two basins.

Until our next newsletter, please visit our website www.dewfora.net regularly to keep track of project's progress and new and interesting result available for you to use in your research and work.

F. Pappenberger, E Dutra & F. Wetterhall (ECMWF)

Picture Showing drying water point

Latest news from the Basins

Stakeholder participation in the Nile Basin

The Nile Basin case study focuses on the Blue Nile and Abtara river basins. It seeks to provide and test all the improved tools for droughts warning and prediction of the effect of climate change on drought risk in the region. An End User workshop was carried out in September, 2012 and involved participants from the different Nile basin countries and some of the Project consortium members from Africa and Europe.

The Workshop aimed at maximizing the involvement of the Nile Basin stakeholders through their participation in the different stages of the project. The stakeholders wished to understand how progress and results from the case study will be disseminated.

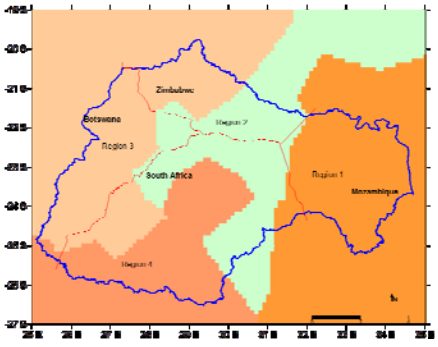
In response; a platform for continuous engagement of stakeholders has been established through the 'African Knowledge Network for Drought Forecast and Mitigation.' Key issues were raised through group discussions. Highlights included Monitoring Datasets, Climate Projections and Drought Risk Analysis. Stakeholders also sought clarification on definitions and the issue of time downscaling.

Overall, the workshop proved a successful gathering between the DEWFORA research team members and the stakeholders and end users from the different Nile Basin countries to exchange knowledge and experiences. The stakeholders provided important ideas and feedback on how to improve DEWFORA results and outcomes

Regional drought analysis of the Limpopo Basin

Droughts are common phenomena in the Limpopo River basin. A spatial analysis of drought characteristics in the Limpopo basin has been undertaken to evaluate its regional implications to water management challenges.

Three important properties of drought, mainly, drought duration, frequency and severity were investigated and drought severity-area-frequency (SAF) curves constructed. The entire Limpopo River Basin was subdivided into different four homogeneous regions owing to topographic and climate variations in the basin.



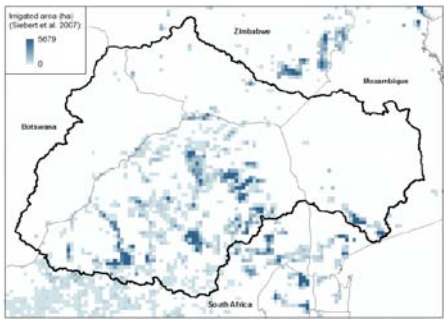
Using the medium range time series of the Standardized Precipitation Index (SPI) as an indicator of drought, for each homogeneous region monthly and annual SAF curves and maps of probability of drought occurrence were produced. The results indicated localized severe droughts in higher frequencies while only moderate to severe low frequency droughts may spread over wider areas in the basin. The approach can be used to develop improved drought indicators, to assess the relationship between drought hazard and vulnerability and to enhance the performance of methods currently used for drought forecasting.

In general, this preliminary investigation reveals that the western part of the basin will face a higher risk of drought when compared to other regions of the Limpopo basin in terms of the medium-term drought. The Limpopo Basin is water stressed and livelihood challenges remain at large, thus impacts of droughts and related resilience options should be taken into account in the formulation of regional sustainable water resources development strategies.

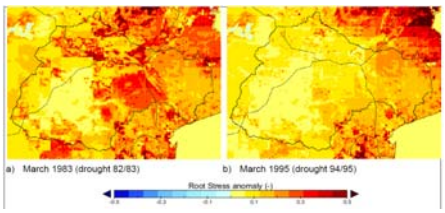
Latest Results & news from the Basins

Downscaled and tailor made hydrological models for the Limpopo and Niger case study Basins

Two process based hydrological models were chosen to simulate the hydrology of the Limpopo and Niger river basins. The models are adapted to represent some region specific conditions in the basins, e.g. large irrigation areas and wetlands.



For the Limpopo river basin case study, a downscaled version of the global PCR-GLOBWB hydrological model is selected. This is a continuous-time simulation, process based distributed model applied on a cell-by-cell basis. The model includes various water storages and flow components including surface, sub-surface and groundwater flows, soil moisture availability, canopy interception and snow storage. New development includes an irrigation scheme to account for the highly modified hydrology in the Limpopo river basin.

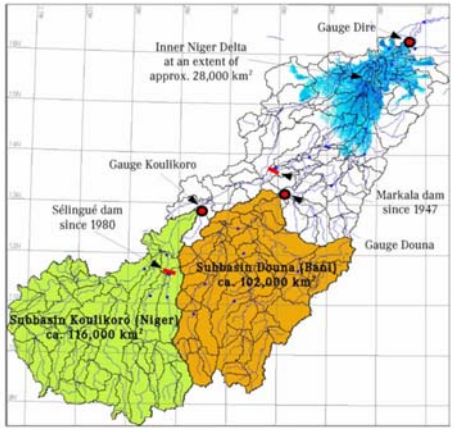


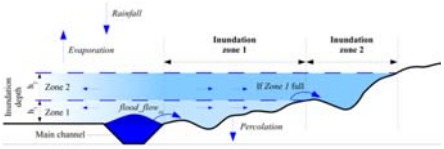
The model is set up for the Limpopo basin with a spatial resolution of 0.05 x 0.05˚ and simulation is carried out for the past 32 year-period on a daily time step. Runoff data available from the basin are used for the verification of the model results. The model is also tested for identifying historic droughts in the basin and to estimate hydrological drought related indices.

The drought identification is done with both a spatially distributed indicator as well as with a runoff indicator in specific discharge stations. The model will be subsequently employed in the project to simulate short to mid-term hydrological drought forecasting.

Id	Station Name	Data Source	Location	Latitude (°)	Longitude (°)	Catch. area (km²)	Data from:	Data until:	Data resolution
1	1196551	GRDC	Limpopo	-22.23	29.99	201,001	07/01/1992	30/09/2011	Daily
2	1196100	GRDC	Olifants River	-24.33	30.74	42,714	01/09/1960	01/12/2011	Daily
3	1196102	GRDC	Olifants River	-24.93	29.39	16,622	01/09/1938	01/06/2011	Daily
4	1196600	GRDC	Olifants River	-26.01	29.25	3,256	01/09/1938	01/06/2011	Daily
5	1196360	GRDC	Makois River	-24.29	28.09	1,801	01/03/1948	01/04/2010	Daily
6	1196350	GRDC	Megalies	-25.78	27.76	1,171	01/10/1922	01/12/2011	Daily
7	1196300	GRDC	Matlabas	-24.16	27.48	1,054	01/09/1962	01/11/2011	Daily
8	1196570	GRDC	Lephalala	-23.96	28.40	636	01/12/1955	01/02/2011	Daily
9	1196420	GRDC	Selons River	-25.64	27.03	517	01/09/1963	01/10/2011	Daily
10	1196700	GRDC	Blyde	-24.68	30.80	514	01/11/1909	01/12/2011	Daily
11	1196500	GRDC	Sand River	-23.67	29.58	6,715	01/10/1947	01/08/2001	Daily
12	A2H000	WA-SA	Kookoli River @ Noordgedacht	-25.06	27.52	20,627	16/09/1982	11/04/2012	Daily
13	A2H132	WA-SA	Kookoli River @ Haakdoring@ff	-24.70	27.41	22,270	14/10/1967	2012-04-10	Daily
14	A2H111	WA-SA	Elands River @ Bulfontein	-25.31	27.48	6,110	17/11/1981	16/04/2012	Daily
15	A2H021	WA-SA	Pienaars River @ Buffelspoort	-25.13	27.63	7,463	01/09/1955	2012-07-03	Monthly
16	A4H005	WA-SA	Makoo River @ Dwaalhoek	-24.06	27.77	3,786	27/09/1962	2012-04-25	Monthly/daily
17	A4H016	WA-SA	Makoo River @ Makoo Nat Res	-23.97	27.73	4,319	01/09/1960	07/03/2012	Daily
18	A5H006	WA-SA	Limpopo River @ Botswana	-22.93	28.00	99,240	12/03/1971	03/03/2012	Monthly/daily
19	A6H035	WA-SA	Mogalakwena River @ Lenesrus	-22.55	28.90	15,845	02/02/1995	08/03/2012	Daily
20	B3H017	WA-SA	Olifants River @ Loskop Nat. Res.	-25.42	29.36	12,295	16/09/1986	03/05/2012	Daily
21	B7H007	WA-SA	Olifants River @ Oxford	-24.18	30.82	46,583	01/10/1955	25/04/2012	Monthly
22	B7H015	WA-SA	Olifants River @ Kruger National Park	-24.67	31.24	49,826	17/11/1967	23/05/2012	Daily
23	E33	ARA-SUL	Limpopo @ Combomune	-23.51	32.46	259,436	02/01/1968	31/08/2011	Daily
24	E35	ARA-SUL	Limpopo @ Chokwé	-24.54	33.06	340,000	16/06/1951	31/05/2011	Daily

For the Niger case study, the eco-hydrological model SWIM is selected and tailored to reproduce past drought events with monthly bias corrected reanalysis climate datasets. SWIM is a daily continuous-time, semi distributed catchment model for the coupled hydrological / vegetation / water quality modelling in mesoscale watersheds. The model is set-up and calibrated to represent region specific processes, stocks and fluxes by using regional ground-truth and remote sensing data. The model enables to consider various water storages and flow components such as soil moisture availability, surface, sub-surface and groundwater flows.





Further developments integrate now reservoir management, wetlands and inundation plain dynamics to account for specific hydrological patterns encountered in the Niger case study. The advancements of the calibration and validation processes for two model setups are presented in the report. The model will be then employed to simulate short to mid-term hydrological forecast and long term hydrological projections in order to assess drought persistence and risk under a range of upstream water resources management.

Events and Announcements

DEWFORA

General Assembly and Management Team Meeting 1-4 February 2013, South Africa.

Training courses (2013):

Drought vulnerability and risk in Africa

Drought forecasting at different geographical scales

Implementation of drought early warning systems and developing the institutional framework for effective response in Africa

Others

UNFCCC conference of the parties COP 18, 24 November-& December 2012, Doha , Qatar.

14th Waternet/WARFSA/GWPSA symposium 30 October to 2 November 2012, Dar Es Salaam, Tanzania.

3rd Southern African Regional Biennial YWP Conference 16th - 18th July 2013 : Music Conservatorium, University of Stellenbosch, South Africa

Others

International Humbolt Kolleg on Management of Water, Energy and Bio-resources in Changing Climate Regime: Emerging Issues and Environmental Challenges: 8-9 February 2013, New Delhi, India

EGU General Assembly: Vienna, Austria 7-12 April 2013

Water and Environmental Dynamics - VI International Conference on Water and Environmental Research:3-7 June 2013, Koblenz, Germany

Discover the DEWFORA consortium: for each issue of the Newsletter two partners will be presented

Partners Profile 5:

CIHEAM

Founded in 1962, the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) is an intergovernmental organisation comprising thirteen member countries from the Mediterranean Basin . In pursuing its three central missions (education, research and cooperation) CIHEAM has come to be recognised as an authority in its fields of activity: Mediterranean agriculture, food and sustainable rural development

Its role in DEWFORA is to develop and implement a knowledge sharing platform for stakeholders and to be involved in in training courses and End User workshops.

More info: www.ciheam.org

Partners Profile 6:

Universidade do Porto
Faculdade de Engenharia
FEUP

The Faculdade de Engenharia da Universidade do Porto (FEUP) is the engineering faculty of the University of Porto, in Porto, Portugal.

In DEWFORA, FEUP will contribute through the development of improved indicators to assess drought vulnerability in African regions. FEUP will also provide a comparative review of African and European drought forecasting systems

More info: www.fe.up.pt

SADC Southern African Development Community Towards a common future
WATERnet
Building capacity for Water Resources Management in Southern Africa

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