Some applications of WRF-Hydro Model

G.T. Diro

Outline

- Offline WRF-Hydro
  - Evaluation, Configuration
  - Process understanding/sensitivity
  - Seasonal early warning
  - Climate change impact studies
- Coupled WRF-Hydro -reanalysis/NWP model driven
  - Flash flood prediction
  - Process understanding/streamflow
- Coupled WRF-Hydro -seasonal forecast driven
  - Seasonal forecasting of streamflow
- Coupled WRF-Hydro - climate change projection
  - Projections of streamflow under SSP scenario

Offline WRF-Hydro driven with reanalysis

- To calibrate and evaluate WRF-Hydro in representing hydrological cycles: Streamflow, Evapotranspiration, soil moisture, ….

ELSEVIER

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Hydrological simulation evaluation with WRF-Hydro in a large and highly complicated watershed: The Xijiang River basin

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Natural Hazards and Earth System Sciences
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Simulation of extreme rainfall and streamflow events in small Mediterranean watersheds with a one-way-coupled atmospheric–hydrologic modelling system

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Offline WRF-Hydro: sensitivity study/process understanding

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Evaluation of a Stand-Alone WRF-Hydro Modeling System Using Different Rainfall Forcing Data: Case Study Over the Godavari River Basin, India

Dhanraj Mane & Anantharaman Chandrasekar

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Confidential manuscript for JH

Understanding the Re-infiltration Process to Simulating Streamflow in North Central Texas using the WRF-Hydro Modeling System

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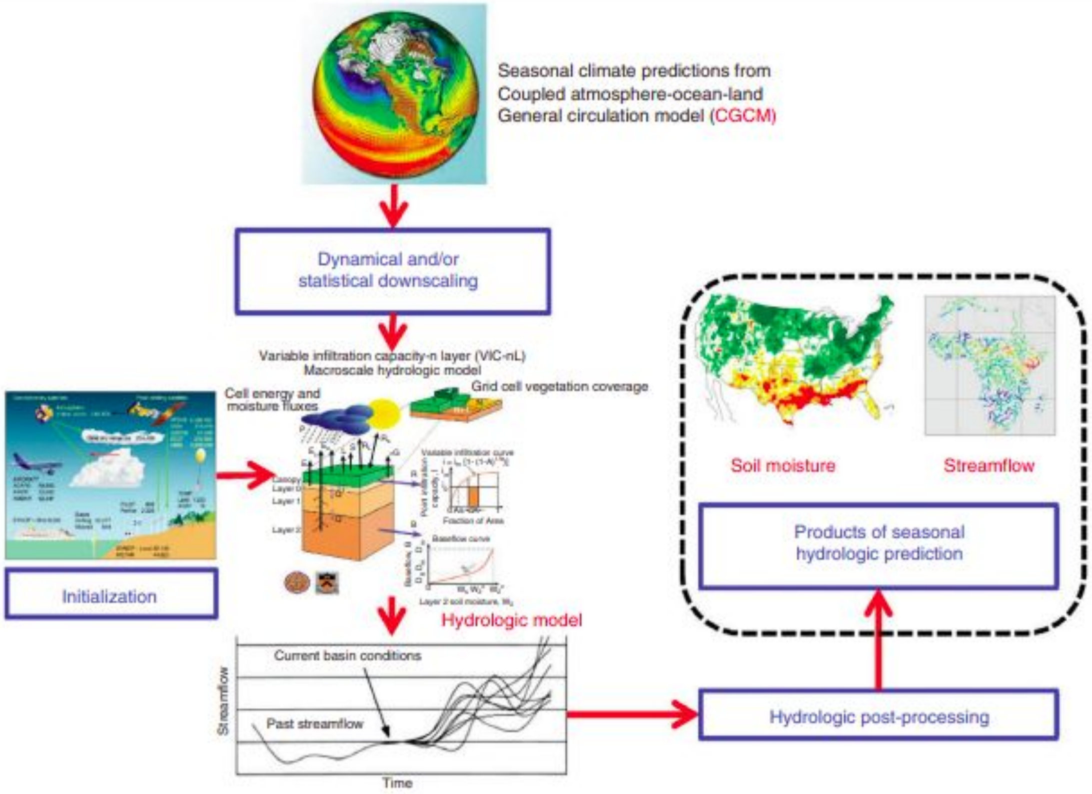
ABSTRACT

WRF-Hydro (Weather Research and Forecasting model-Hydrological modeling system), as the core engine of the United States National Water Model (NWM), has now been used in many hydrometeorological applications throughout the world. One important feature that WRF-Hydro introduced is to allow infiltration excess ("ponded water") for subsequent lateral re-distribution

Using offline WRF-Hydro for seasonal forecasting



Offline WRF-Hydro : for streamflow projection

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Ensemble projections of future streamflow droughts in Europe

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Abstract. There is growing concern in Europe about the possible rise in the severity and frequency of extreme drought events as a manifestation of climate change. In order to plan suitable adaptation strategies it is important for decision makers to know how drought conditions will develop at regional scales. This paper therefore addresses the issue of future developments in streamflow drought characteristics across Europe. Through offline coupling of a hydrological model with an ensemble of bias-corrected climate simulations (IPCC SRES A1B) and a water use scenario (Economy First), long-term (1961–2100) ensemble streamflow simulations are generated that account for changes in climate, and the uncertainty therein, and in water consumption. Using extreme value analysis we derive minimum flow and deficit indices and evaluate how the magnitude and severity of low-flow conditions may evolve throughout the 21st century. This analysis shows that streamflow droughts will become more severe and persistent in many parts of Europe due to climate change, except for northern and northeastern parts of Europe.

1 Introduction

Drought is a natural feature of the water cycle that can occur in all climatic zones. It originates from a temporary aberration of the normal precipitation regime over a large area, but other climatic factors, such as high temperatures and winds or low relative humidity, can significantly aggravate the severity of the event. Anthropogenic drivers, such as intensive water use and poor water management, can further exacerbate low-flow conditions in watersheds, with a consequent increase in vulnerability to drought (e.g., Vörösmarty et al., 2000; Tallaksen and van Lanen 2004; Döll et al., 2009; Wada et al., 2013a). Water scarcity reflects the imbalance that arises from an overexploitation of water resources, caused by consumption being significantly higher than the natural renewable availability (Schmidt and Benítez-Sanz, 2013; Van Loon and Van Lanen, 2013). Albeit water scarcity may relate to any hydrological condition, it is more likely to occur under

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Uncertainty in hydrologic impacts of climate change in the Sierra Nevada, California, under two emissions scenarios

Edwin P. Maurer

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Abstract A hydrologic model was driven by the climate projected by 11 GCMs under two emissions scenarios (the higher emission SRES A2 and the lower emission SRES B1) to investigate whether the projected hydrologic changes by 2071–2100 have a high statistical confidence, and to determine the confidence level that the A2 and B1 emissions scenarios produce differing impacts. There are highly significant average temperature increases by 2071–2100 of 3.7°C under A2 and 2.4°C under B1; July increases are 5°C for A2 and 3°C for B1. Two high confidence hydrologic impacts are increasing winter streamflow and decreasing late spring and summer flow. Less snow at the end of winter is a confident projection, as is earlier arrival of the annual flow volume, which has important implications on California water management. The two emissions pathways show some differing

Coupled WRF-Hydro : Flash flood forecasting/simulation

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Implementation of WRF-Hydro at two drainage basins in the region of Attica, Greece, for operational flood forecasting

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Abstract. An integrated modeling approach for forecasting flood events is presented in the current study. An advanced flood forecasting model, which is based on the coupling of hydrological and atmospheric components, was used for a twofold objective: first to investigate the potential of a coupled hydrometeorological model to be used for flood forecasting at two medium-size drainage basins in the area of Attica (Greece) and second to investigate the influence of

1 Introduction

Floods are among the most common natural disasters related to deaths, destruction, and economic losses. Worldwide, 500 000 deaths due to floods have been reported from 1980 to 2009, with more than 2.8 billion people being affected (Doocy et al., 2013). Petrucci et al. (2018), who

Applying a coupled hydrometeorological simulation system to flash flood forecasting over the Korean Peninsula

Young Ryu, Yoon-Jin Lim, Hee-Sook Ji, Hyun-Hee Park, Eun-Chul Chang & Baek-Jo Kim

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Abstract

In flash flood forecasting, it is necessary to consider not only traditional meteorological variables such as precipitation, evapotranspiration, and soil moisture, but also hydrological components such as streamflow. To address this challenge, the application of high resolution coupled atmospheric-hydrological models is emerging as a promising alternative. This study demonstrates the feasibility of linking a coupled atmospheric-hydrological model (WRF/WRFHydro) with 150-m horizontal grid spacing for flash flood forecasting in Korea. The study area is the Namgang Dam basin in Southern Korea, a mountainous area located downstream of Jiri Mountain (1915 m in height). Under flash flood conditions, the simulated precipitation over the entire basin is comparable to the domain-averaged precipitation, but discharge data from WRF-Hydro shows some differences in the total available water and the temporal distribution of streamflow (given by the timing of the streamflow peak following

Coupled WRF-Hydro: process understanding

RESEARCH ARTICLE

WILEY

Diurnal cycle of surface energy fluxes in high mountain terrain: High-resolution fully coupled atmosphere-hydrology modelling and impact of lateral flow

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Abstract

Water and energy fluxes are inextricably interlinked within the interface of the land surface and the atmosphere. In the regional earth system models, the lower boundary parameterization of land surface neglects lateral hydrological processes, which may inadequately depict the surface water and energy fluxes variations, thus affecting the simulated atmospheric system through land-atmosphere feedbacks. Therefore, the main objective of this study is to evaluate the hydrologically enhanced regional climate modelling in order to represent the diurnal cycle of surface energy fluxes in high spatial and temporal resolution. In this study, the Weather Research and Forecasting model (WRF) and coupled WRF Hydrological modelling system (WRF-Hydro) are applied in a high alpine catchment in Northeastern Tibetan Plateau, the headwater area of the Heihe River. By evaluating and intercomparing model results by both models, the role of lateral flow processes on the surface energy fluxes dynamics is

Coupled WRF-Hydro for Seasonal forecast

There is a window of Opportunity

Coupled WRF-Hydro for Climate impact studies

There is a window of Opportunity