

Topnet

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Abstract	
Name	TopNet
Description	A semi-distributed hydrological model for simulating catchment water balance and river flow.
Local Contact	Dr. Christian Zammit
Wiki URL	https://teamwork.niwa.co.nz/display/IFM/Topnet

Scope	
Intended biophysical domains	Soil-plant-animal Streams and rivers
Does the model address water quality	No
Water quality parameters	
Intended purpose	Research purposes: climate change and land use change effects on hydrological cycle Application purposes: Simulation of catchment water balances and river flow, and flood forecasting
Intended types of user	Highly trained personnel
Intended breadth of user base (in-house specialist to widespread)	In-house specialist
Geographic range limitations	Mostly used in New Zealand, but with applications overseas, such as in the United States of America and Chile
Spatial resolution	Sub-catchment (e.g., 10km ²)
Spatial extent	Medium or large catchment/aquifer/river network/lake/estuary or coastal embayment
Steady state or dynamic	Dynamic
Temporal resolution	From hourly to daily
Temporal extent	Unlimited
Spatial types	Lumped spatially
Spatial dimensions	3D
Supermodel Membership	If part of a supermodel, describe

Inputs

Climate	Climate data
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Topography and topology	Surface topography
Soils	Soil name or map
Landcover/use	Crop and stock types and attributes
Groundwater	
Water quantity/quality flux and state	

Input data required: old items to be removed once transferred to new template	Climate (e.g., rainfall and temperature), topography (e.g. slope and river network), soil type, and vegetation type
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Outputs	
Climate	
Topography and topology	
Soils	
Landcover/use	
Groundwater	
Water quantity/quality flux and state	Drainage from soil Surface runoff into stream

Ouput data produced: old items to be removed once transferred to new template	Infiltration excess runoff, saturation excess runoff, base flow, drainage from the soil to the saturated zone (recharge), percent saturated area, potential evapotranspiration, and actual evapotranspiration
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Development history	
Main developers	National Institute of Water and Atmospheric Research
Other development organisations	
Current custodian organisation	National Institute of Water and Atmospheric Research
Funding mechanism	Government funded
State of development	stable release
First development year	1997
Latest release year	2011
Latest version	Version 11
Current development activity	Coupling with a glacier component and developing a retrospective streamflow assimilation scheme
Likely longevity	Currently funded and likely to remain supported

Cost and IP	
Purchase or licence cost	N/A
Support cost	N/A
Licence type	N/A
Commercial or IP constraints on use	Need permission for commercial use
Open/Closed Source	Closed Source

Applications

Locations	Organisations	Description	Publications
New Zealand	National Institute of Water and Atmospheric Research	The National Institute of Water and Atmospheric Research was commissioned by the Statistics New Zealand to estimate eleven components of the national and regional water balance of New Zealand for each of the sixteen years from 1 July 1994 to 30 June 2010.	Henderson et al. (2011)

Technical considerations

Languages used	Fortran and C
Is a formal API defined?	No
Is the model engine separated from the user interface?	No
User Interface	Command Line
Techniques/methods for data input	In order to use TopNet, the user needs to have all the input data compiled.
Input data formats	NetCDF
Techniques/methods for data output	The TopNet generates the output data
Output data formats	NetCDF
Techniques/methods for data visualisation	N/A
Techniques/methods for user interaction and control	Model run automatically based on the information from a configuration file
Methods included for calibration and uncertainty	(1) Manual calibration (2) Monte Carlo simulation: a large number of different parameter sets are tried and the best set selected based on an objective function (e.g. the Nash Sutcliffe criteria). (3) NLFit: a parameter fitting Windows-based program that uses optimal parameter search algorithms.
Operating system / platforms	Linux MS Windows
Quality of code and systems engineering	N/A
Willingness of developers to collaborate	Good
Stability	Good
Availability of documentation of theory and code/software	User manual and help files available on the NIWA website (https://one.niwa.co.nz/display/HYPRO/TOPNET+++Model).

User information

What do users have to learn?	Operation of Linux system and basic understanding of hydrology
Ease of learning	Difficult
Ease of use	Difficult
Availability and completeness of user documentation/manuals	Available online and in papers
Availability of support	Good
Willingness of developers to support users	Good

Availability of user forums	None
Other information	
Linkages to other models	No
Notes	

Links

Name	URL	Description
	https://one.niwa.co.nz/display/HYPRO/TopNet	NIWA website

References

Ref	Description
Henderson, R., S. Singh, R. Woods, C. Zammit (2011), Surface water components of New Zealand's National Water Accounts, 1995-2010, NIWA Client Report (in review).	