Integrated Modelling Program for Canada
Global Water Futures

Multi-model Intercomparison Project on the Saskatchewan-Nelson-Churchill River Basin (Nelson-MiP project)

Monthly meeting - 12 February 2020

Environment and Climate Change Canada
Environnement et Changement climatique Canada

STRATEGIC COMMUNITY CONSULTING

Western University · Canada

University of Saskatchewan

Manitoba Infrastructure

Water Security Agency

UNBC University of Northern British Columbia

University of Waterloo

Manitoba Hydro

University of Alberta

University of Manitoba

University of Calgary

Agenda

1. Presentation of gauging stations submitted
2. Selection of gauge stations for calibration/validation for Phase 0 & Phase 1
3. Decision on time periods for model calibration/validation
4. Discussion on a standardized meteorological forcing data
5. Discussion on a common routing scheme and geophysical input data

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Presentation of the gauge stations submitted

Station_ID	Station_Name	Province	Latitude	Longitude	Year_From	Year_To	Gross_Dra	BASINS	HYPE	SWAT-GIW	SWAT-GWF	VIC	HEC-HMS	SUMMA	WATFLOOD-MH	RAVEN	HBV-EC	WATFLOOD-MI	MESH	SWAT-RRB	TOTAL
04GA001	LAKE ST. JOSEPH OUTFLOW T	ON	51.13	-90.20	1935	1994	-	WINNIPE G RIVER	X												1
04GA002	CAT RIVER BELOW WESLEYAN	ON	51.74	-91.59	1970	2017	5390	WINNIPE G RIVER	X												1
05AA023	Oldman River near Waldrons Co	AB	49.81	-114.18	1949	2008	1446	SASKATCHEWAN RIVER											X		1
05AB046	Willow Creek at Highway NO. 811	AB	49.75	-113.4	1999	2018	2510	SASKATCHEWAN RIVER											X		1
05BB001	BOW RIVER AT BANFF	AB	51.17	-115.57	1909	2020	2210	SASKATCHEWAN RIVER											X		1
05CA009	RED DEER RIVER BELOW BURN	AB	51.65	-115.02	1973	2020	2250	SASKATCHEWAN RIVER											X		1
05CB001	LITTLE RED DEER RIVER NEAR	AB	52.03	-114.14	1960	2020	2580	SASKATCHEWAN RIVER											X		1
05DB006	CLEARWATER RIVER NEAR DO	AB	52.25	-114.86	1975	2020	2250	SASKATCHEWAN RIVER											X		1
05DD007	BRAZEAU RIVER BELOW CARD	AB	52.88	-116.56	1961	2020	2600	SASKATCHEWAN RIVER											X		1
05FA011	Battle River at Duhamel (only 11	AB	52.94	-112.96	1931	2014	5010	SASKATCHEWAN RIVER											X		1
05KH007	CARROT RIVER NEAR TURNBE	SK	53.61	-102.10	1966	2020	12600	SASKATCHEWAN RIVER	X												1
05LC001	RED DEER RIVER NEAR ERWOO	SK	52.86	-102.20	1974	2020	11000	WINNIPE G LAKE	X												1
05LH005	WATERHEN RIVER NEAR WATE	MB	51.85	-99.55	1950	2020	55100	WINNIPE G LAKE	X												1
05MC001	ASSINIBOINE RIVER AT STURG	SK	51.94	-102.55	1944	2020	1930	ASSINIB OINE R		X											1
05MC003	LILIAN RIVER NEAR LADY LAKE	SK	52.02	-102.63	1965	2020	229	ASSINIB OINE R		X											1
05OF009	ROSEISLE CREEK NEAR ROSEI	MB	49.50	-98.33	1965	2020	223	RED RIVER					X								1
05OF010	BOYNE RIVER NEAR TREHERN	MB	49.67	-98.64	1967	1994	270	RED RIVER					X								1
05OF011	BOYNE RIVER NEAR ROSEISLE	MB	49.55	-98.41	1967	2020	589	RED RIVER					X								1
05PA006	NAMAKAN RIVER AT OUTLET C	ON	48.38	-92.18	1923	2020	13400	WINNIPEG RIVER	X												1
05PB014	TURTLE RIVER NEAR MINE CEN	ON	48.85	-92.72	1917	2020	4770	WINNIPEG RIVER	X												1
05PH003	WHITEMOUTH RIVER NEAR WH	MB	49.94	-95.96	1956	2020	3750	WINNIPEG RIVER							X			x			2
05QA004	STURGEON RIVER AT MCDOU	ON	50.17	-91.54	1961	2020	4440	WINNIPEG RIVER							X						1
05QE009	STURGEON RIVER AT OUTLET	ON	50.35	-94.47	1960	2020	1530	WINNIPEG RIVER							X						1
05RB003	BLOODVEIN RIVER ABOVE BL	MB	51.70	-96.60	1976	2020	9090	LAKE WINNIPEG	X												1
05RD007	BERENS RIVER AT OUTLET OF	MB	52.20	-96.10	1957	1992	18400	LAKE WINNIPEG	X												1
05DR008	PIGEON RIVER AT OUTLET OF	MB	52.03	-96.39	1957	1996	18400	LAKE WINNIPEG	X												1
05TD001	GRASS RIVER ABOVE STANDI	MB	55.74	-97.01	1959	2020	15400	NELSON RIVER	X			X			X			x			4
05TE002	BURNTWOOD RIVER ABOVE LI	MB	55.50	-99.22	1985	2017	5810	NELSON RIVER	X			X			X						3
05TG002	TAYLOR RIVER NEAR THOMPS	MB	55.49	-98.19	1970	2020	886	NELSON RIVER				X									1
05TG003	ODEI RIVER NEAR THOMPSON	MB	56.00	-97.36	1979	2020	6110	NELSON RIVER	X			X			X			x			4
05TG006	SAPOCHI RIVER NEAR NELSO	MB	55.91	-98.49	1993	2016	391	NELSON RIVER				X									1
05TF002	FOOTPRINT RIVER ABOVE FO	MB	55.93	-98.89	1977	2020	643	NELSON RIVER				X									1
05UA003	GUNISAO RIVER AT JAM RAPI	MB	53.82	-97.78	1972	2020	4610	NELSON RIVER				X									1
05UF004	KETTLE RIVER NEAR GILLAM	MB	56.34	-94.70	1966	2020	1090	NELSON RIVER				X									1
05UG001	LIMESTONE RIVER NEAR BIRD	MB	56.51	-94.22	1970	2020	3270	NELSON RIVER				X									1
05UH002	WEIR RIVER ABOVE THE MOUT	MB	57.02	-93.45	1977	2017	2190	NELSON RIVER				X									1
06AD001	BEAVER RIVER NEAR DORINTC	SK	54.30	-108.60	1933	2020	20500	UPPER CHURCHILL	X												1
06AD006	BEAVER RIVER AT COLD LAKE	AB	54.36	-110.22	1955	2020	14500	UPPER CHURCHILL	X												1
06CD002	CHURCHILL RIVER ABOVE OTT	SK	55.65	-104.74	1963	2020	119000	UPPER CHURCHILL	X						X						2
06DA002	COCHRANE RIVER NEAR BROC	MB	58.00	-101.40	1972	2020	28400	UPPER CHURCHILL	X												1
06DA004	GEIKIE RIVER BELOW WHEELE	SK	57.58	-104.19	1966	2020	7730	UPPER CHURCHILL	X						X						2
06DC001	WATHAMAN RIVER BELOW WA	SK	57.09	-103.71	1971	2020	10200	UPPER CHURCHILL							X						1
06FA001	GAUER RIVER BELOW THORST	MB	57.30	-97.52	1979	2020	5970	LOWER NELSON	X												1
	NELSON OUTLET (from Dery et al.)		56.91	-93.23	1981	2016	1111890	LOWER NELSON	X												1
05051500	RED RIVER OF THE NORTH AT	ND	46.27	-96.60	1942	2020	10386	RED RIVER												X	1
05066500	GOOSE RIVER AT HILLSBORO	MN	47.41	-97.06	1931	2020	1203	RED RIVER	X												1
05082500	RED RIVER OF THE NORTH AT	MN	47.93	-97.03		2020	30100	RED RIVER												X	1
05092000	RED RIVER OF THE NORTH AT	ND	48.57	-97.15	1936	2020	34800	RED RIVER												X	1
TOTAL									21	2		10	3	all	9	?			8	3	

Selection of gauge stations for calibration/validation (Phases 0 & 1)

- **Search criteria:**

Station == Natural

Data Period == 1970 to 2016

Total Years >= 35

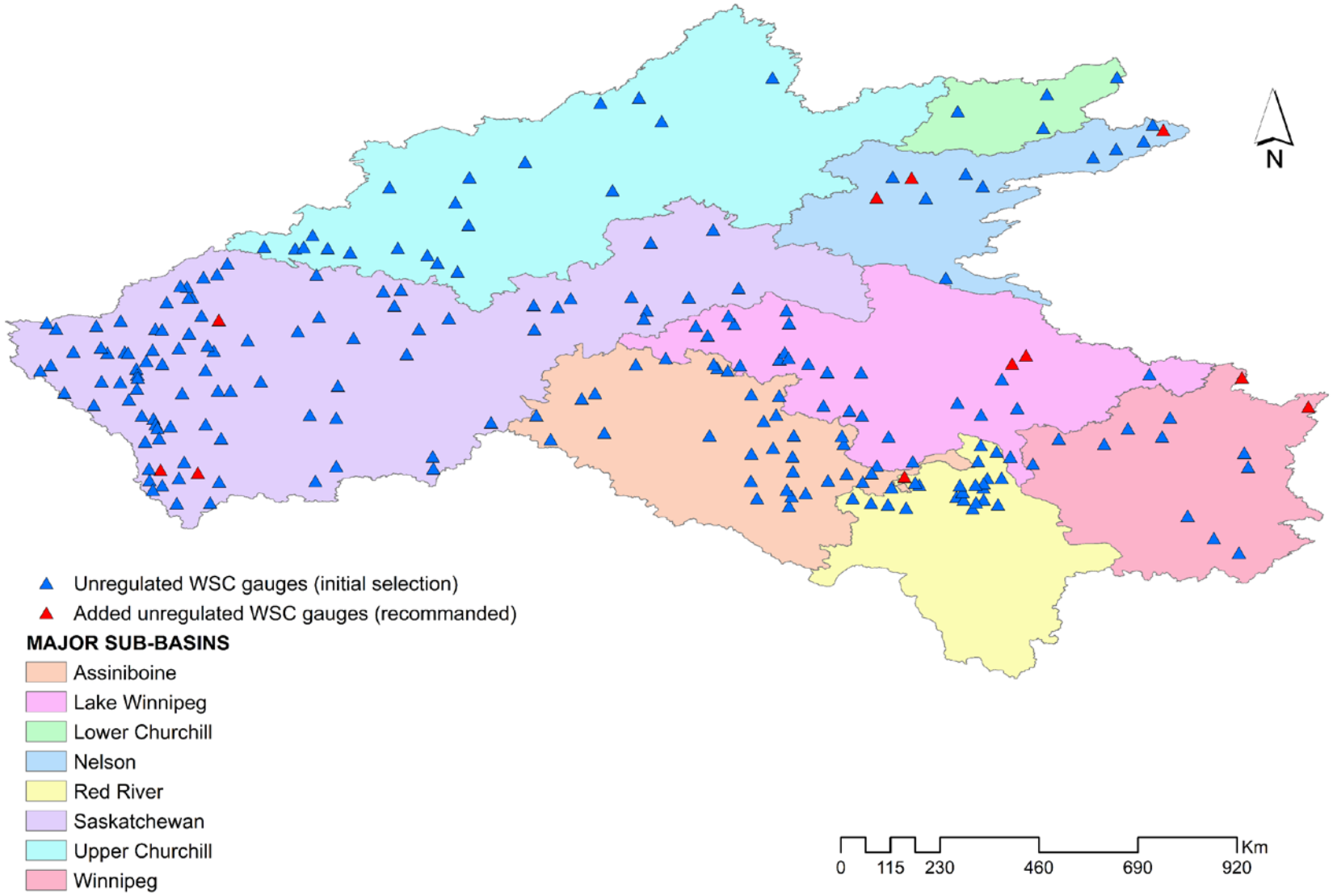
Drainage area >= 200 km^2

+

Stations submitted but not meeting search criteria

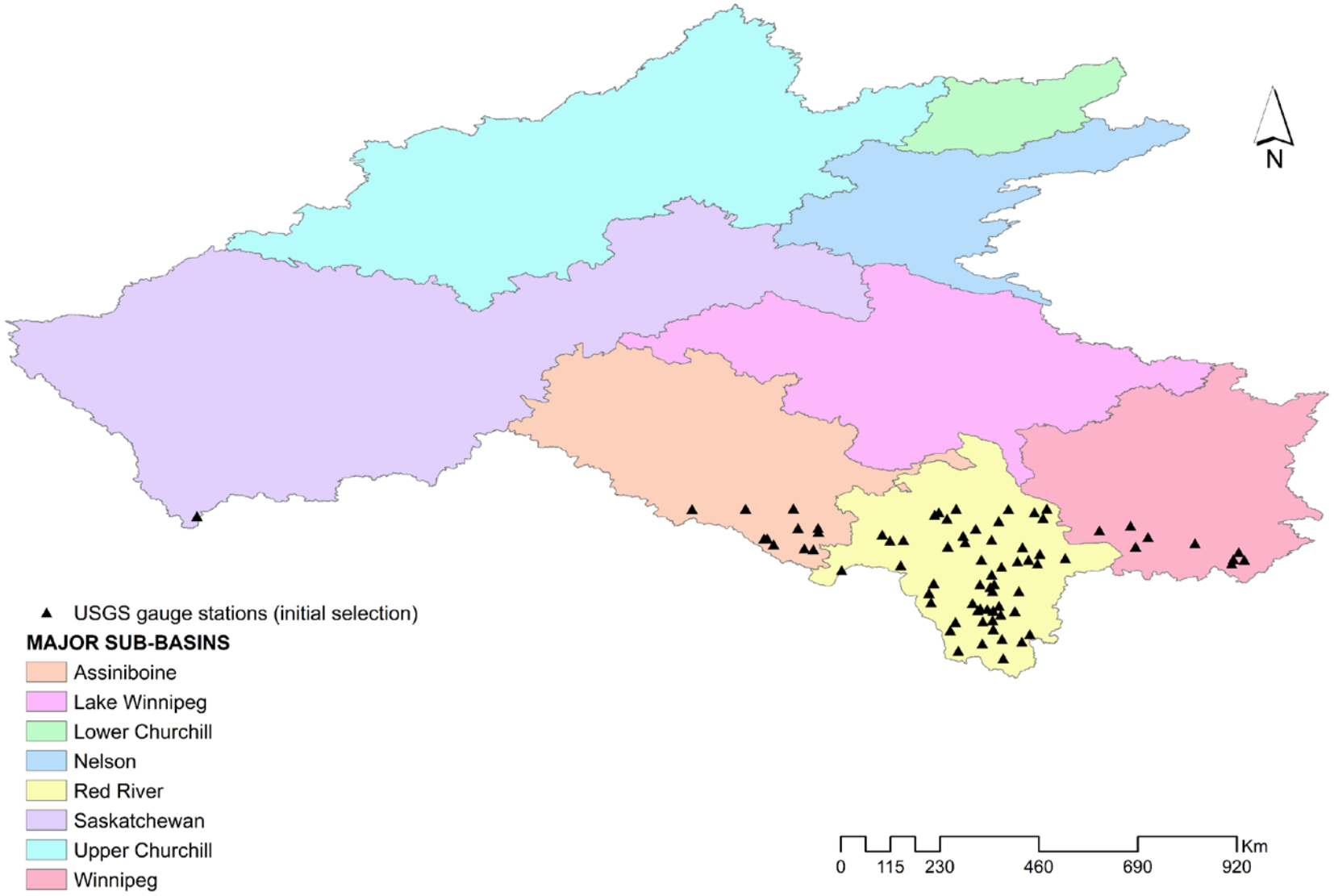
- 291 (natural) gauge stations identified + 11 stations added

Selection of gauge stations for calibration/validation (Phases 0 & 1)



Sub-basins	Number of WSC natural stations
Assiniboine	32
Lake Winnipeg	28
Winnipeg river	13
Upper Churchill	20
Lower Churchill	4
Saskatchewan river	94
Red River	23
Nelson river	12

Selection of gauge stations for calibration/validation (Phases 0 & 1)



Sub-basins	Number of USGS stations
Assiniboine	11
Lake Winnipeg	-
Winnipeg river	9
Upper Churchill	-
Lower Churchill	-
Saskatchewan river	1
Red River	55
Nelson river	-

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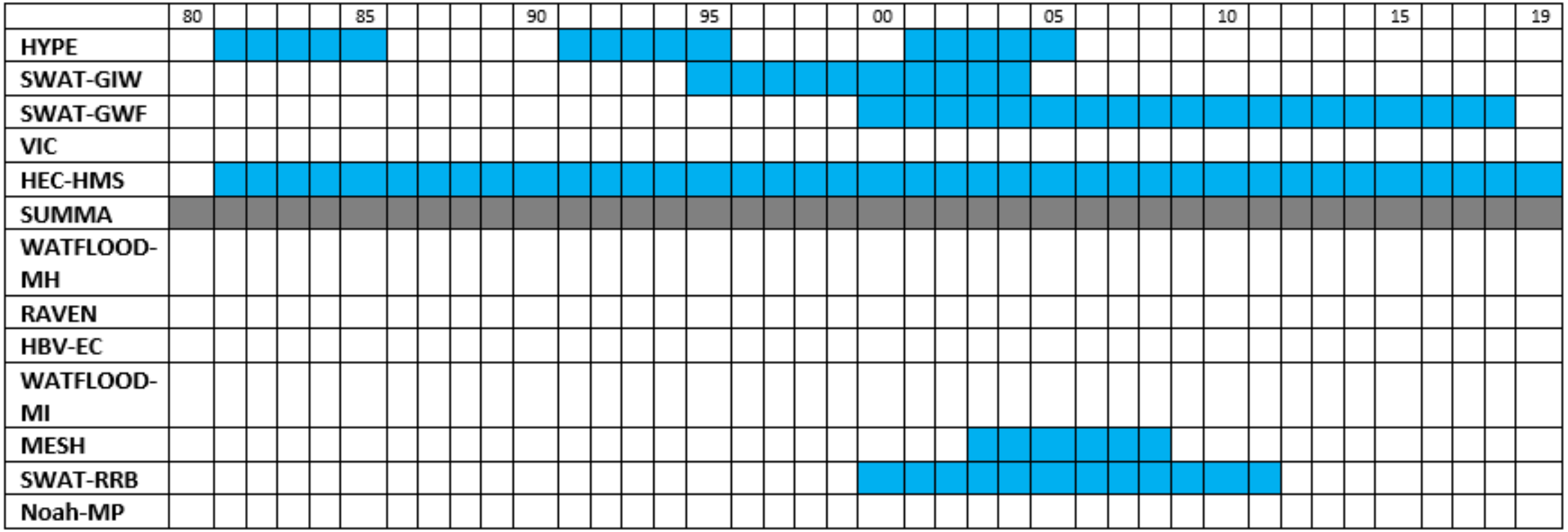
Time periods for calibration/validation

- **Calibration**



No calibration for SUMMA

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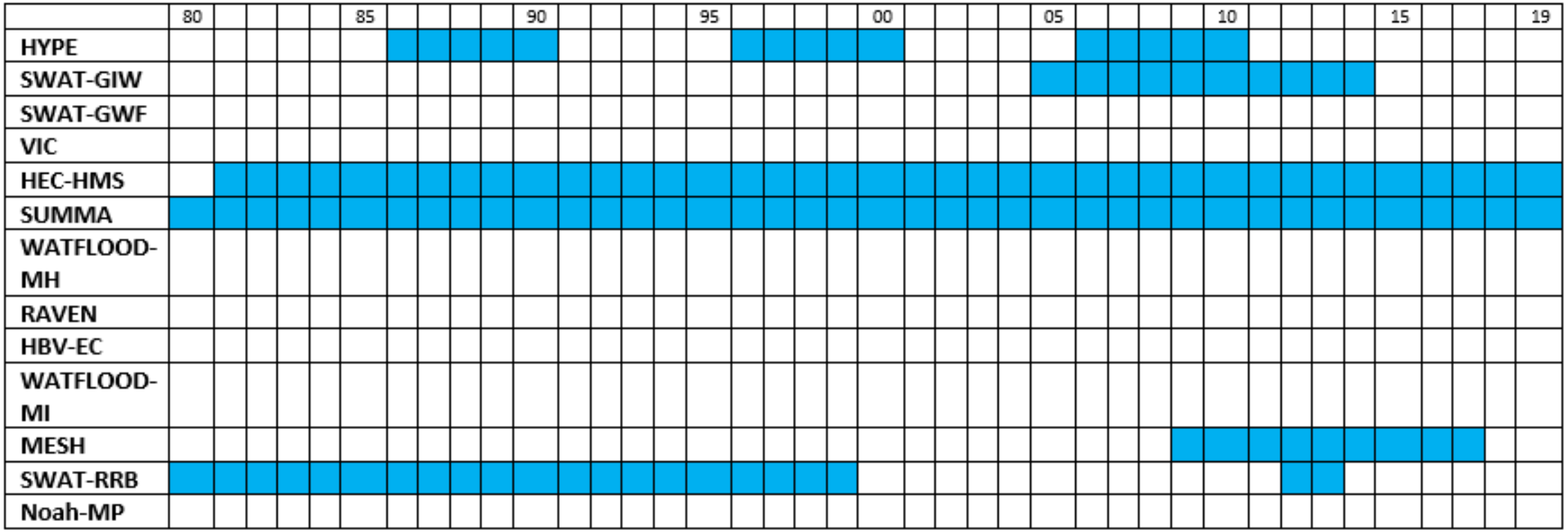
Time periods for calibration/validation

- **Validation**



Standardized meteorological forcing data

	ERA5	WFDEI-GEM-CaPA	NCEP-CFRS	Standard MiP data
HYPE	X			X
SWAT-GIW		X	X	
SWAT-GWF				
VIC				
HEC-HMS	X			X
SUMMA	X			
WATFLOOD-MH				
RAVEN				
HBV-EC				
WATFLOOD-MI				
MESH		X		
SWAT-RRB		X		X
Noah-MP				

- We have to choose between ERA5 and WFDEI-GEM-CaPA
- WFDEI-GEM-CaPA ➔ 3-hourly, 0.125° ~ 10 km, 1979-2016
  (huss, pr, ps, rlds, rsds, sfcWind, tas)
- ERA 5 ➔ 1-hourly, ~31km-grid, 137 levels to 0.01hPA, 1979-near real time

Routing scheme and other geophysical inputs

- Land use/ land cover: North American Land Change Monitoring System (NALCMS)
- NALCMS is provided at 250m and **30m** spatial resolution, contains 19 land cover classes, and is publicly available from http://www.cec.org/tools-and-resources/map-files/land-cover-2010-landsat-30m.
- Soil data: Global Soil Dataset for Earth System Modelling (GSDE)
- GSDE is provided at 30 arc-second resolution **(~1km**), and contains 11 types of soil general information for soil profiles and 34 soil properties for 8 depths up to 2.3 m. It can be downloaded from http://globalchange.bnu.edu.cn/research/soilw#download.

Routing scheme and other geophysical inputs

- We should decide on using a standardized routing scheme or not.
- Bryan Tolson's group (UWaterloo) offers to produce a routing scheme (including lakes) if all modelers will use it.
- If Bryan idea is accepted, we shoud also decide whether the routing scheme shall be derived using HydroSHEDS 3-arc sec DEM (~90m) or MERIT Hydro 3-arc sec data products (https://doi.org/10.1029/2019WR024873).

Follow up

1. Ajay will follow up with analysis of wet/dry periods from 1980-2016 for selection of calibration and validation periods.
   - Recommendation to be made before next meeting
2. Forcing data selection will be circulated (based on discussion and follow up) before next meeting
3. Hervé will refine and circulate an updated gauge selection map.
4. All groups to explore soil datasets to be used
   - Provide recommendations of datasets to Hervé by **March 9**
5. All groups to consider offline routing advantages/disadvantages
6. Next meeting scheduled for **Wednesday March 11 @10:00AM MST**