1. Role of lakes in the arctic system

Need of a comprehensive lake model

Role in water, and energy balance - how lakes interact in a landscape scale

Role lakes in biogeochemical (CO_2 and CH_4) cycling

What is the evolution of lakes, stability, mechanism and rates

How sensitive are lakes to changes in permafrost and evap/precip dynamics

Will modern studies of sedimentation and evaporation help us interpret paleo record

Broader implications-
Effects on subsistence and wildfowl,
dam construction and impoundments

Uncertainty very high

Importance –very high

Confidence – very high

Readiness- good, but lacking approaches to study taliks

2. What is the role of the arctic ocean for cloud formation, and role of clouds for arctic energy balance, evaporation, precipitation. Where does arctic precipitation come from?

Importance is very high
Confidence - fair
Readiness unknown

3. What are the relationships among aerosols and cloud formation (from all sources, including fires) and precipitation

Importance is very high
Confidence - fair
Readiness unknown

4. T,P,Q measurements/sampling strategy/scale of variability/ data quality/ instrument development.

Key parameters are snow water equivalent, and soil moisture

Scaling and sampling - scaling rules change along some boundaries - discontinuous versus permafrost for example, ocean land boundary.

Importance is very high

Readiness – very high but , we need remote sensing measures not fully developed.

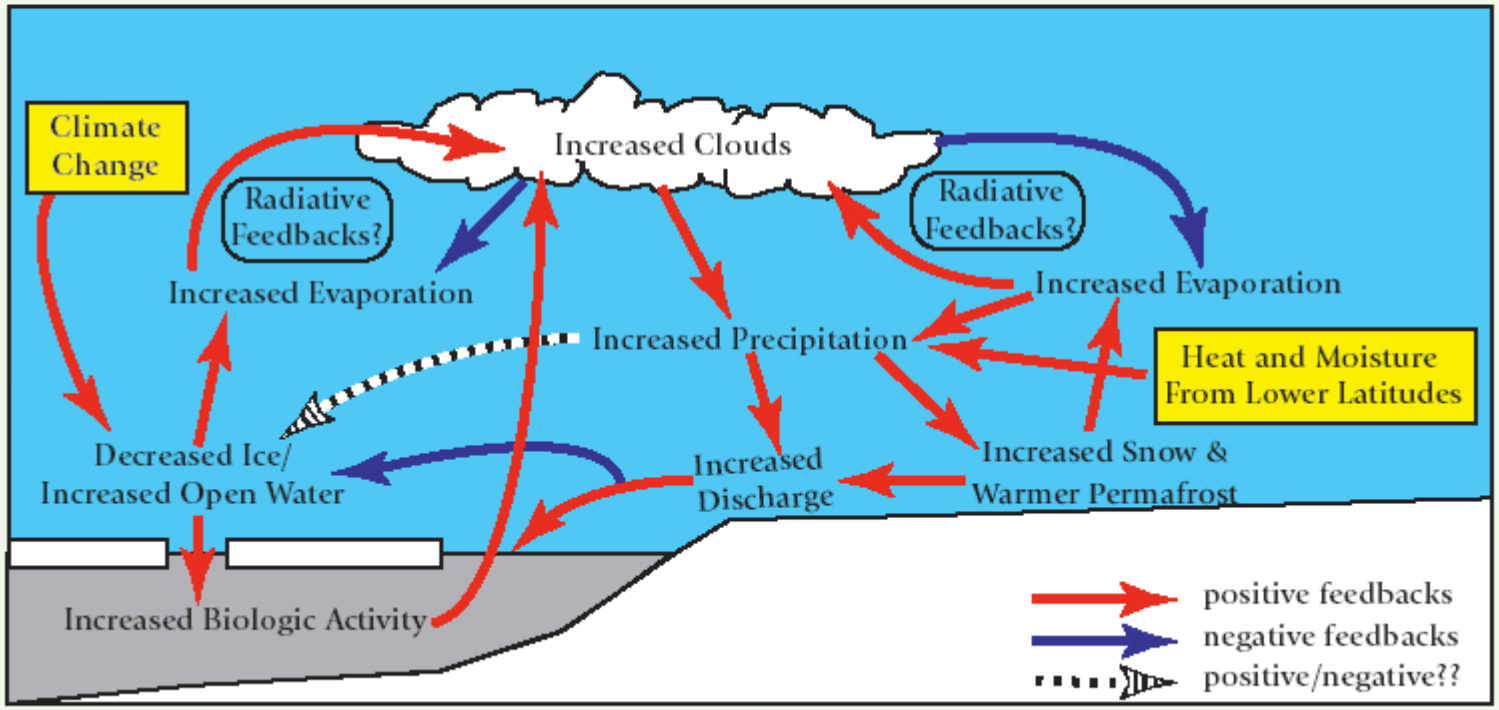
5. Watershed dynamics

Snow

Vegetation (ET and heat)

Biogeochemistry (salts, nutrient cycling)

Box 5-3. Feedbacks Among Sea Ice, Precipitation, River Runoff, and Coastal Oceans



Hydrological perspective

1. ***What are some of the key uncertainties?***

A. The controls on the timing, magnitude and quality of river inputs into the Arctic Ocean.

B. The fate of the fresh water input into the Arctic Ocean.

C. The impacts of land/ocean hydrological coupling on the Arctic System and the Global Climate system.

D. The impacts of changes in the hydrologic cycle on humans.

2. What is the impact of these uncertainties on our understanding of the Arctic system?

3. What is our level of confidence in the above assessment?

Criteria

Do we know the magnitude and timing of the flux?

Do we know the impact of a change in flux?

Can we scale these adequately?

4. What is our level of readiness with this assessment?

Sufficiency of current techniques?

Current data acquisition networks

5. Should this focus be addressed by a new or existing initiative?

Components of key uncertainties

Precipitation
Evaporation/Transpiration
River Discharge (water and constituents)
Snow melt
Soil Moisture and
runoff pathways
Lakes and significance of taliks
Ice sheets and glacier
Net moisture transport (into or out of the Arctic)
Effect of River Discharge on Ocean
Coastal Baroclinicity
Snow heterogeneity
River ice and sub-ice flow
Permafrost dynamics and thermokarsting
Vegetation's control on runoff and surface energy balance