Consiglio Nazionale delle Ricerche

Istituto per le Applicazioni del Calcolo "Mauro Picone"

Outline of the activities developed by the Italian group

Italian team: Daniela Mansutti, Edoardo Bucchignani, Maria M. Cerimele, Alessandro Forieri, Giuseppe Pontrelli;
Rossella Cossu and Andrea Di Mascio *(new entries)*

SvalGlac ESF Project

2nd year, by 30-10-'11 (3rd SC meeting, Oslo)

According to the Italian Plan of Activity:

- implementation, debugging and validation of in-house code for the diagnostic study of a subglacial lake. Testing (*in progress*) on Amundsenisen area upon data provided by Jaime O. and Paco (see figures at bottom).

  >>>*Many aspects have been tested:*
  1. viscosity dependency on temperature (polythermal ice field)
  2. ice/water phase change temperature dependency on hydrostatic pressure
  3. steady air/ice (material) interface, no accumulation/ablation
  4. ice overburden pressure effect on ice field motion
  5. ice sheet sliding on rocky bottom
  6. water density dependency on temperature

  >>>*and many others are 'on the way' (end of 2nd year of activity):*
  1'.viscosity dependency on deformation tensor (Glen's law, n=3)
  5'. water filtration at rocky bottom below ice field
  6'.water density dependency on pressure
  7. further calibration of: flow rate factor (ice), sliding law constant (ice/rock), eddy viscosity/diffusion coefficients (lake)
  8. thermodynamics of firn and effect of its weight
  9. estimation of the geothermal heat flux

In addition:

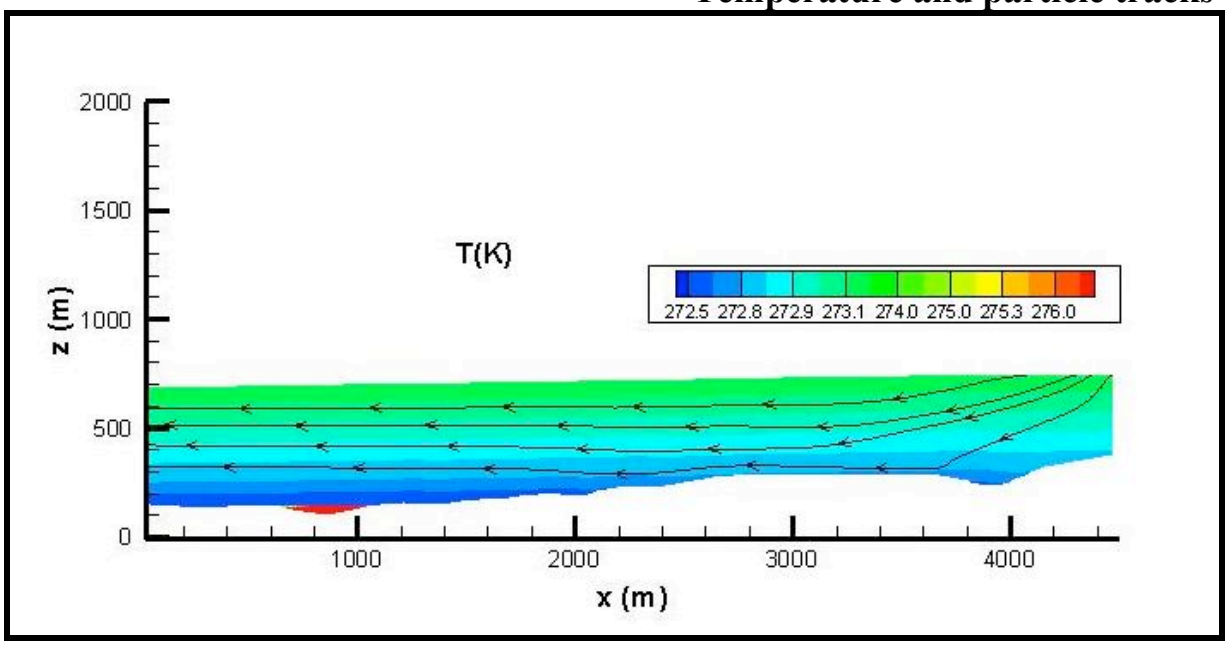
- development of several tests of application of a segmentation technique for SAR images, based on level set modeling and *in-house* numerical code, aimed to identify different ice zones (snow, firn, ice) for comparison within time sequences (*feasibility under evaluation* with Jacek J., Malgorzata B.)

Test case: **Amundsenisen,**
section upon conjectured subglacial lake

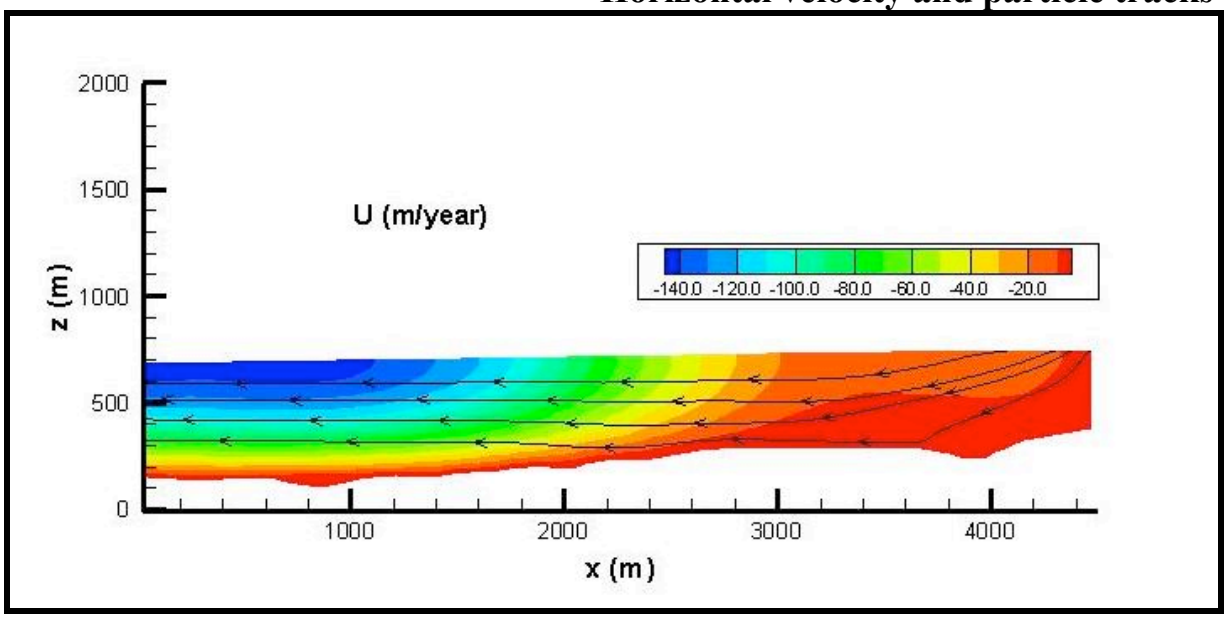
Initial condition: (t = 0)
fully developed ice field flow (Jaime O.)
and lake at rest;
temperate ice
and temperature conducting profile in the lake

Numerical (unsteady) solution at t = 112 *days*

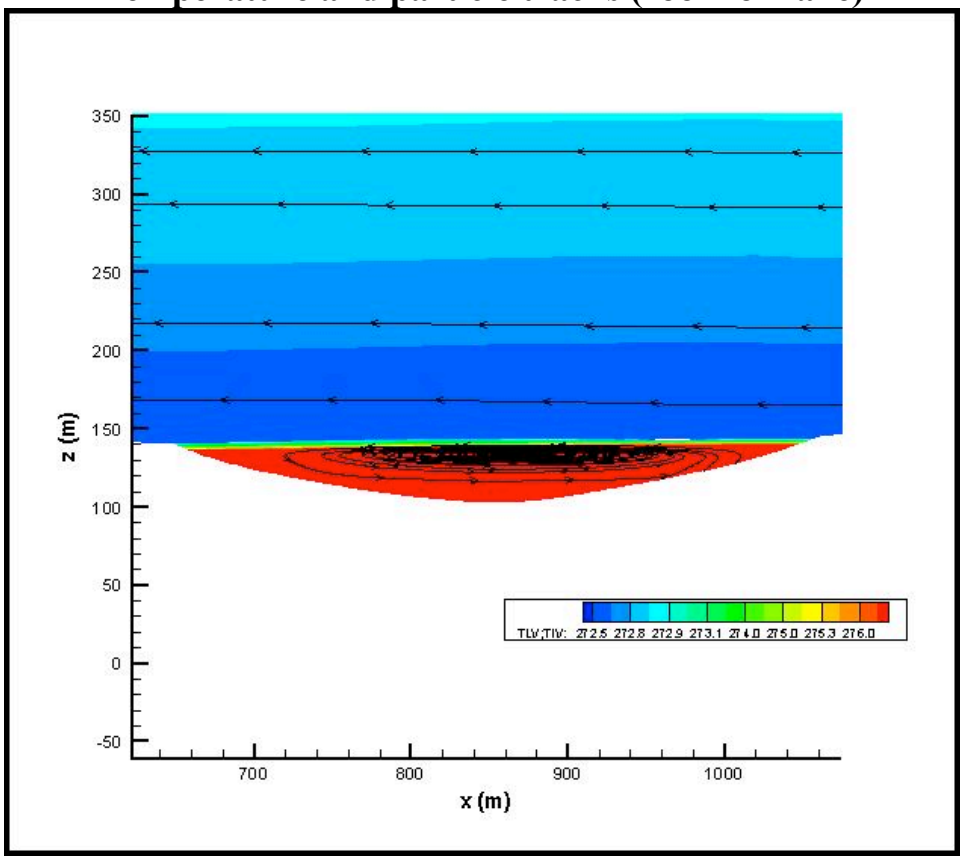
Temperature and particle tracks

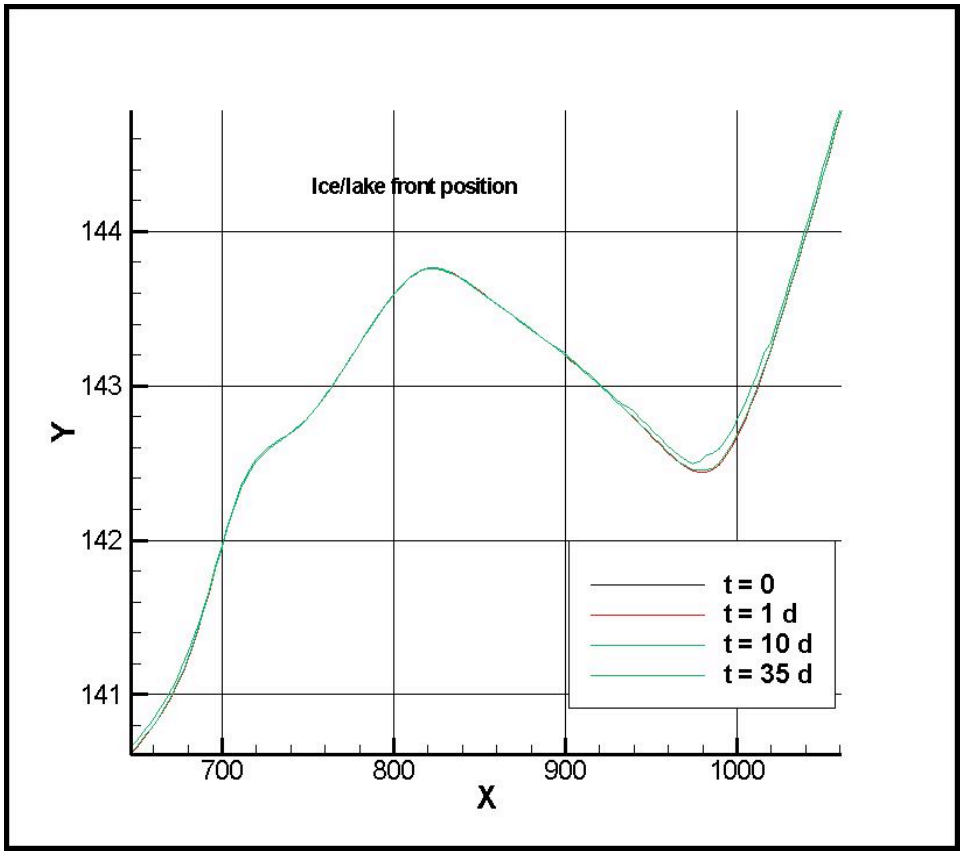


Horizontal velocity and particle tracks



Temperature and particle tracks (zoom on lake)





Validation parameters: measured top sliding velocity
observed ice/water interface

Temperature at lake vertical centerline

