SEQINEQ Project
On the way to developing northern greenhouses adapted to population and climate: energy issues


Kuujjuaq Greenhouse
- Built in 2012
- Ground surface of 1500 sq. ft (140 m²)
- Made of polycarbonate
- Growing season from June to September (no heating system)
- In 2016, one ton of fresh vegetable were collected

Seqineq objectives
- Increase the culture period and the production with a fossil fuel consumption as low as possible
- However a greenhouse is a complex energetic system due to multiple and strong interactions between canopy, indoor climate and outdoor weather
- A numerical model is necessary to quantify the impact of energy systems to be added
- Instrumentation is needed:
  1) To better understand the thermal behavior of the greenhouse
  2) To obtain unknown data (input of the model)
  3) To validate the numerical model

Instrumentation
- Acquisition system using electronic boards which are:
  - Cheap, robust, lightweight, small and standardized
  - Using open source environment

Automation in real time of the following data:
- Solar fluxes inside and outside the greenhouse
- External temperature and RH
- Ambient temperature and RH
- Soil temperature
- One photo a day

Data
- More than one year of new data, unavailable in the literature, were collected
- Important potential of solar energy to produce electricity or heat
- No thermal gradient but the temperature difference is high between day and night: mean difference of 25°C (77°F)
- Solution: increase thermal inertia thanks to water or rock in order to store the daily heat to release it by night

Outlook
- Complete the instrumentation by adding anemometers and CO₂ sensors in order to have a better understanding of the interaction between plants and climate
- Develop an online tool (which include the greenhouse model) to design optimized northern greenhouses
- This project is part of a large-scale project currently in development

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