

Calculation of NIR effect on greenhouse climate in various conditions

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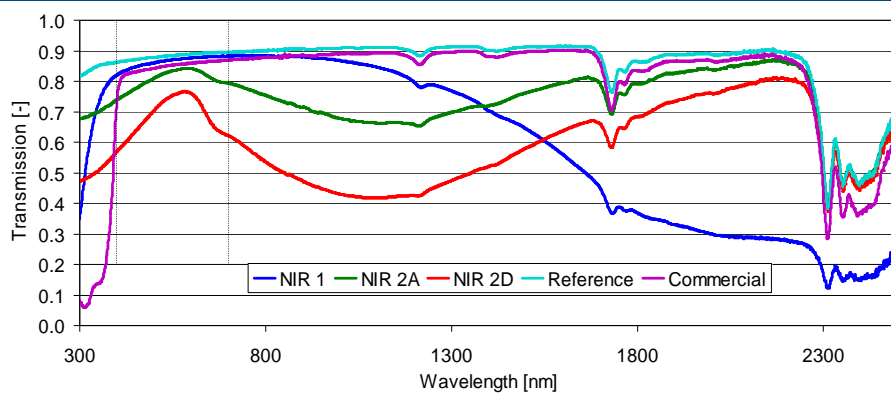


Problem: High temperatures in temperate regions

- Cutting-off the NIR component of sun radiation might help.
- NIR can be excluded by reflection or absorption.
- Crop is a good reflector for NIR.
- Efficiency of reflection is limited by re-reflection.
- Absorption by nano particles → surface-plasmon resonant.
- The effect of these absorbers on greenhouse climate was calculated with a simulation model.



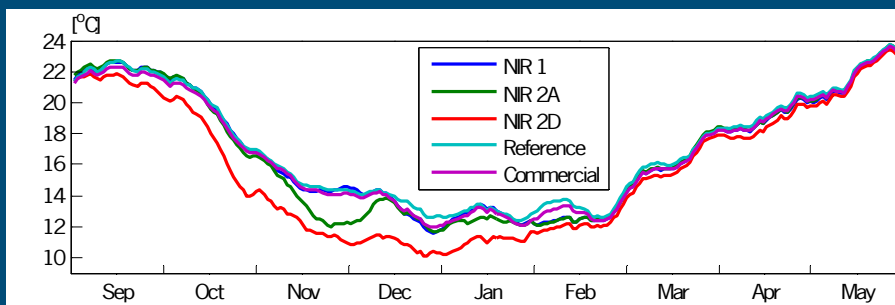
Transmission of 5 plastic films



- NIR absorption up to 39%



Long term effect on air temperature



- In winter a larger fraction of the absorbed energy is released outside.
- greenhouse temperature is lowered by the NIR-filter



Conclusions

- A year-round NIR filter will lower temperature in winter.
- In summer sometimes even higher temperatures.
- The combined effect of all spectral properties (τ , α , ε) needs to be considered.
- As some of the negative effects of a NIR filter may be mitigated by adapting ventilation set-points, it is worthwhile to verify results in an experiment.

