



# **The Canadian RCM : general overview of the model and specific features of the Narccap simulations**

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# CRCM v4.2.0 (version used for the Narccap simulations)

## Dynamics

semi-implicit semi-Lagrangian algorithm

Arakawa-C grid on polar stereographic projection

Gal-Chen scaled-height vertical coordinates

Davies nesting on horizontal wind

large-scale nudging (aka spectral nudging)

## Physics

Surface scheme

CLASS 2.7 (3 yrs)  
soil: Wilson & Henderson-Sellers 1°  
veg: GLC2000 1km > 1°

Convection and large scale  
condensation

Bechtold-Kain-Fritsch  
sursaturation removal

Radiation

SW Fouquart & Bonnel  
LW Morcrette

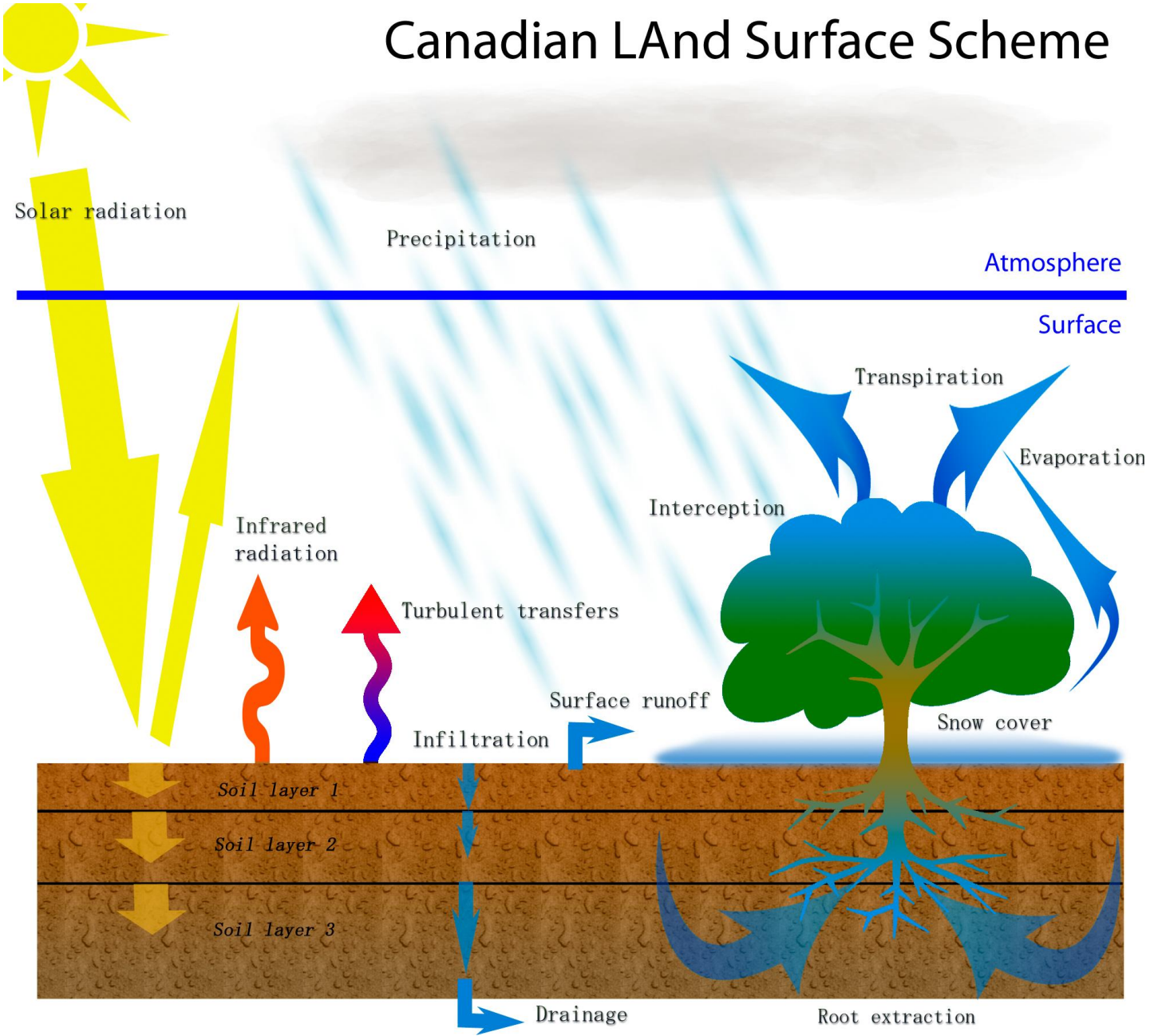
Clouds

diagnostically based on relative  
humidity excess & conditional  
stability

# Key features

- CLASS surface scheme
- Large-scale nudging

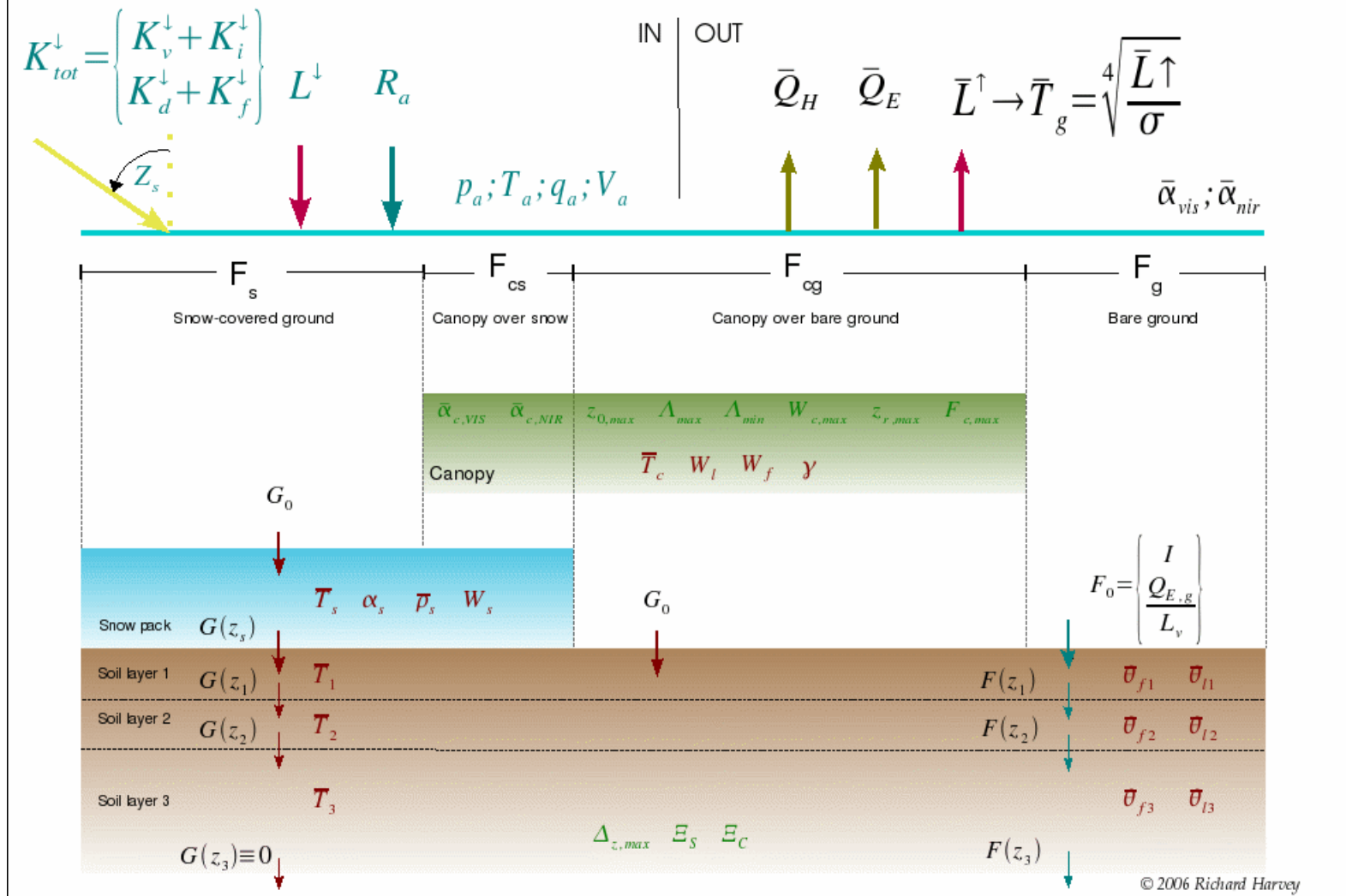
# Canadian LAnd Surface Scheme



## 2<sup>nd</sup> generation surface scheme with 3 soil layers

### The Canadian Land Surface Scheme v2.x

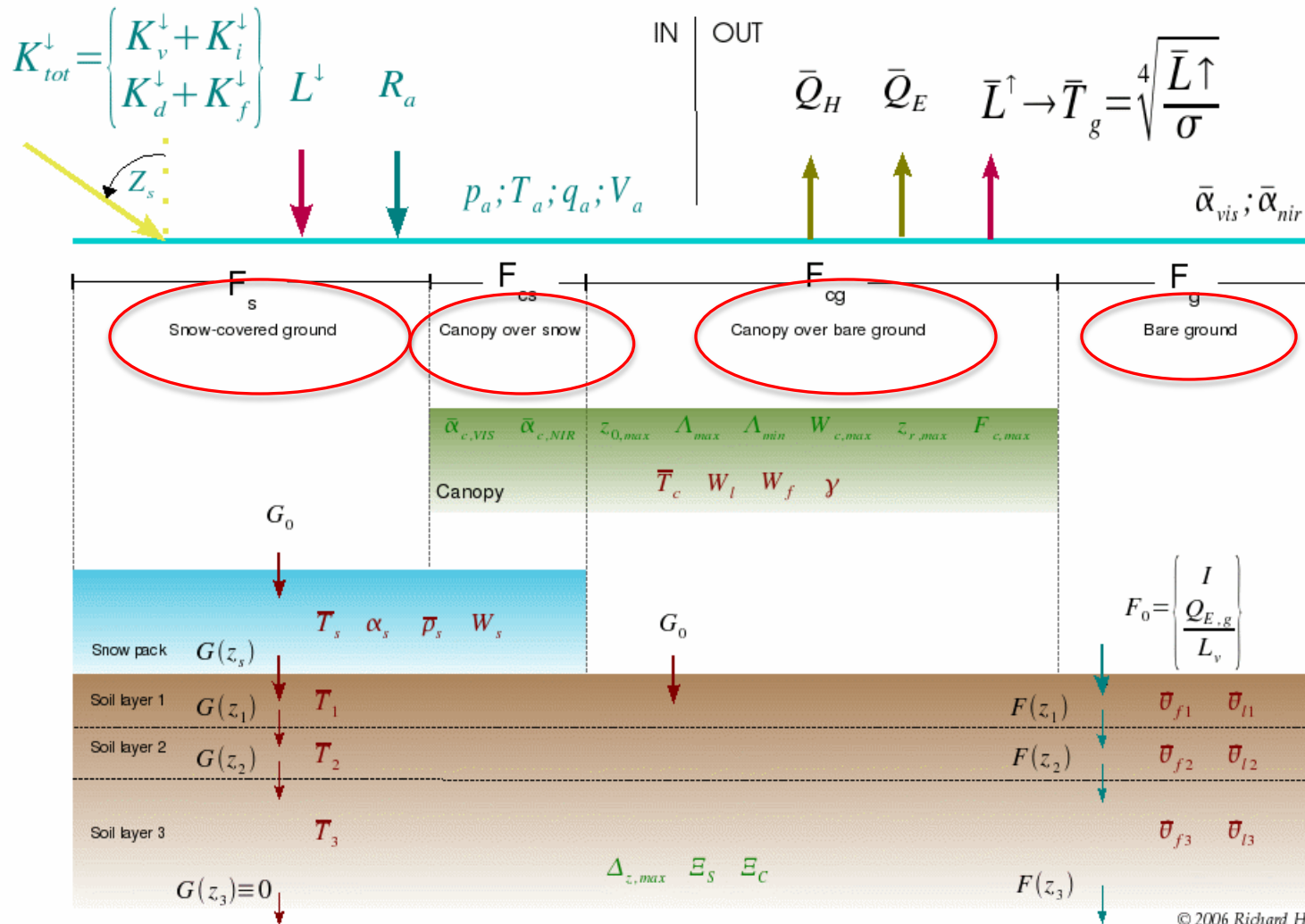
Overview



Each cell is divided in 4 sub-regions

# The Canadian Land Surface Scheme v2.x

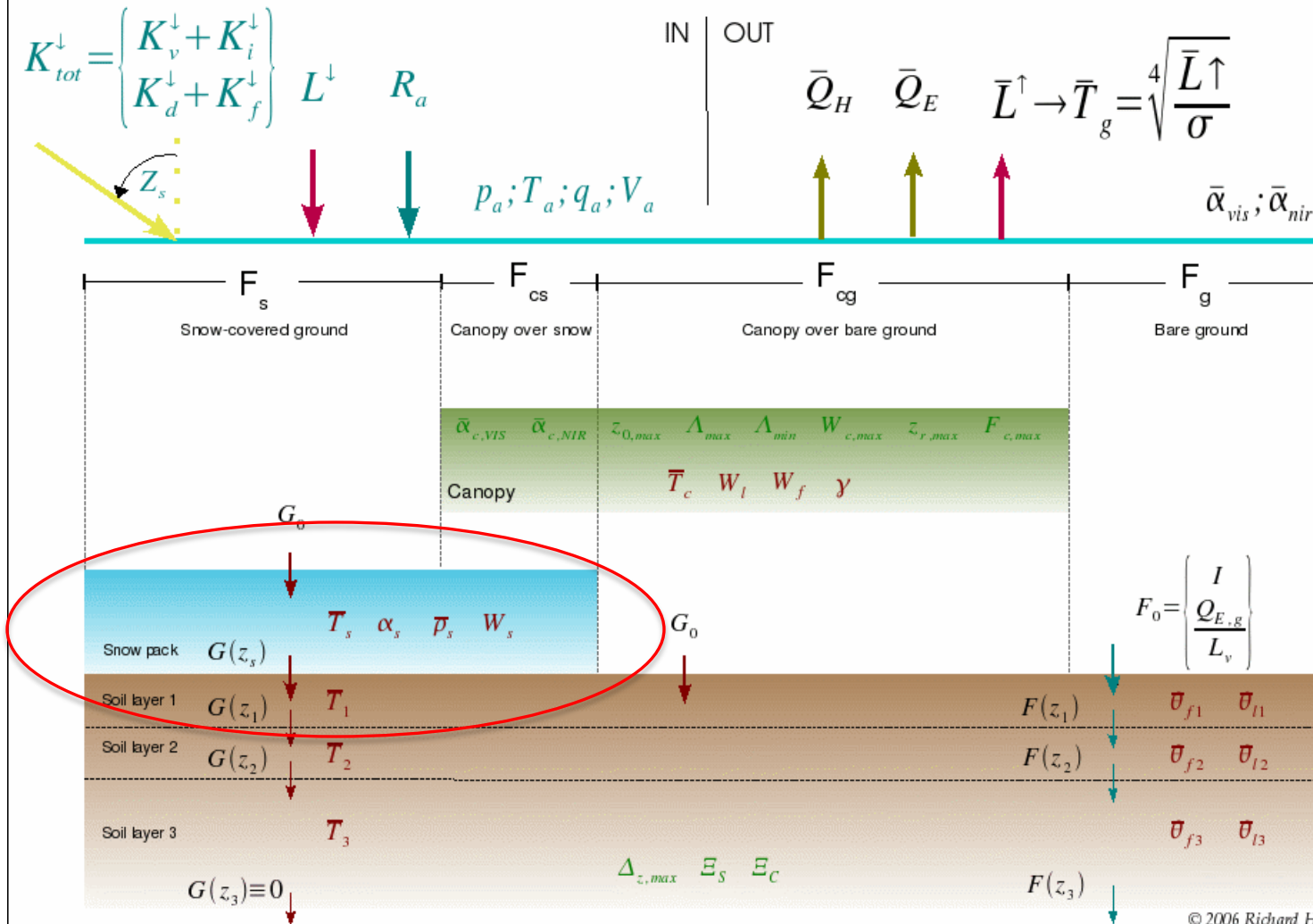
Overview



# Sowpack treated as explicit 4<sup>th</sup> layer

## The Canadian Land Surface Scheme v2.x

Overview

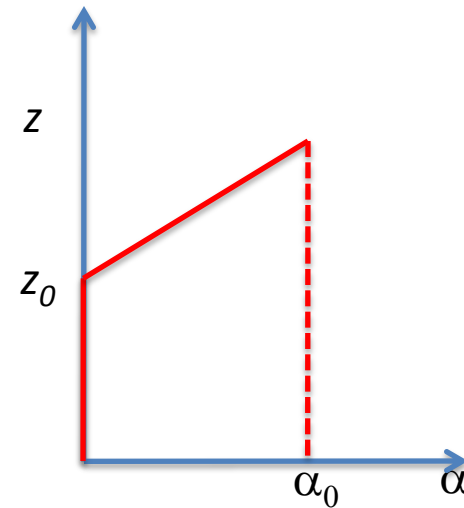
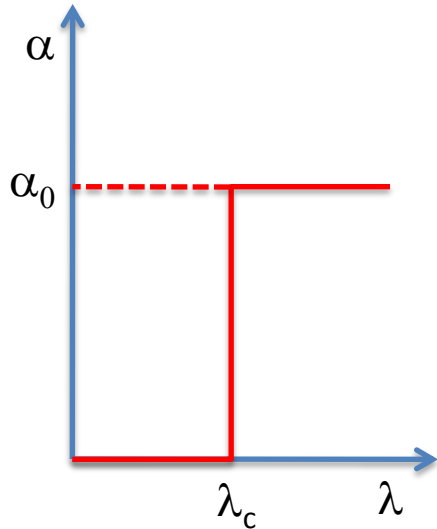


# Large-scale Nudging.

Modification of a prognostic variables  $X$  with the following equation :

$$X_{RCM}^+ = (1 - \alpha)X_{RCM} + \alpha X_{LBC}$$

Where  $X_{RCM}$  is the value of  $X$  from the RCM,  $X_{LBC}$  is the value of  $X$  from the LBC and  $\alpha$  is a function of the length scale  $\lambda$  and the altitude  $z$ .



Only the fields higher than altitude  $z_0$  and with scale larger than  $\lambda_c$  are affected by the large-scale nudging.

Typically,  $\lambda_c=1400\text{km}$ ,  $z_0=500\text{ hPa}$  and  $X=\text{horizontal wind}$   
 $\alpha_0=0.05$  (i.e. e folding time of 48h)