# IMPACT OF CLIMATE-INDUCED UV RADIATION CHANGES ON HUMAN HEALTH

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DECEMBER 7, 2010

## VITAMIN D

- generated either by UV exposure or through dietary sources
- recognized as a preventive agent in several autoimmune diseases
- indicated as an important factor in the prevention of several types of cancer



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#### MAIN MESSAGE

- inadequate levels of vitamin D in up to 97% of Canadians (Schwalfenberg)
- prediction of a decrease of >10% in the UV index at high northern latitudes by 2100 (Hegglin and Shepherd)



Hegglin and Shepherd

In an already vulnerable population, predicted changes represent a serious risk

## **PROJECT GOALS**

In collaboration with public health and medical scientists

- develop a policy-relevant framework to assess the impact of the UV changes on human health in Canada
- produce a report on the policy-relevant key findings of the health impact study



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## **OUR CHALLENGES**

- the relationship between vitamin D levels and UV exposure in the Canadian population
- UV narrow band (280 315 nm) irradiances
- cloud cover and transmission functions



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## **CANADIAN HEALTH MEASURES SURVEY**

- the most comprehensive direct health measures survey in Canada
- nationally representative samples from 14 collection sites
- period of 2007 2009 & 14 collection sites
- blood data to examine 25-hydroxyvitamin D [25(OH)D] concentrations
- data on other factors affecting vitamin D status



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## **TUV CALCULATIONS**

- the Tropospheric Ultraviolet and Visible Radiation Model (TUV) to calculate surface irradiance for narrow UV band (Madronich et al.)
- validated against four Canadian Brewer stations
- main input parameters:
  - daily temperature profiles from ECMWF
  - chemical compositions and surface albedo data from OMI



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## **CANADIAN UV ATLAS**

- preparing the data set of relevant atmospheric compositions from existing CMAM simulations for different regions of Canada for the beginning, middle and end of 21<sup>st</sup> century
- calculating clear-sky UV irradiance changes at the surface from the TUV model



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## OUTLOOK

- combine CHMS data with TUV-extracted UV data to assess the relationship between vitamin D levels and UV exposure
- build an atlas of clear-sky UV irradiance changes at the surface and changes in cloudiness
- provide estimates of time required to obtain 1 SDD
- publish results of impact study as a policy brief

For 2007-2009 14 Canadian sites

For 21<sup>st</sup> century over Canada

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