Geoscientific Model Development
Juno Hsu, Michael Prather, Philip Cameron-Smith, Alex Veidenbaum, & Alex Nicolau (2017), Geosci. Model Dev., 10, 2525-2545, doi: 10.5194/gmd-10-2525-2017.

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A radiative transfer module for calculating photolysis rates and solar heating in climate models: Solar-J v7.5.

Solar-J (2017) extends UCI's Cloud-J (a UV-Vis photolysis module) to full solar spectrum using RRTMG-SW for 0.7-12 μm. Solar-J has the goal of delivering more accurate heating rates with comparably small errors in all components, unlike current GCM heating codes.

	Solar-J heating & photolysis rates		**RRTMG-SW** heating rates
Stratus Cloud	***errors***		***errors***
8-stream RT	**1-2%***	2-stream RT	**4-10%**
Clear sky heating (stratosphere)			
Fast-J	**0-4%***	RRTMG	**~10%**
Clear sky heating (troposphere)			
RRTMG adapted	**1-4%**	RRTMG	**~0%**
High SZA (88-95°)			
semi-spherical	**<5%***	flat atmos.	**>>5%**
Fractional Cloud Cover			
Cloud-J quad.	**1-2%**	MC ICA	**>10% rms**

** Estimated values , for Solar-J it is based on previous model-model and model-measurement comparisons, for RRTMG it is relative to Solar-J or based on RRTMG publications.*

Co-occurrence of extremes in ozone, particulate matter, and temperature

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J.L. Schnell and M.J. Prather (2017), PNAS, 114(11): 2854-2859, doi: 10.1073/pnas.1614453114.

A new method for regular gridding of daily surface O_3, $PM_{2.5}$ & T has developed a climatology for surface pollution and extremes for 1999-2013 (*Schnell et al. ACP 2014*).

This climatology has been used to define extreme episodes (95th %ile in summer).

- surface O3 (O3X)
- $PM_{2.5}$ (PMX)
- temperature (TXX)

1. *Extreme episodes are 1000 km in scale and last days – see the 5-day sequence shown here.*
2. *They sometimes overlap (exacerbating health effects), but often do not.*
3. *Surprisingly ozone extremes (O3X) precede heat waves (TXX); stagnation days are NOT a good predictor.*