Seoul, South Korea Pollution



Stratospheric Ozone

Atmospheric Attenuation of Solar Radiation



1 Dobson Unit (DU) is defined to be 0.01 mm thickness at stp. The ozone layer over Labrador, New Zealand is ~300 DU.



OMI Total Ozone: January 1, 2006



OMI Total Ozone: October 1, 2006



Solar Spectrum and Absorption X-Sections



Absorption Cross Section – Probability of an absorption process.

Chapman Mechanism for Stratospheric Ozone

Ground-level triplet state O(³P), highly reactive $O_{\gamma} + hv \rightarrow O + O \qquad (\lambda < 240 \text{ nm})$ (R1) $O + O_2 + M \rightarrow O_3 + M$ (R2)M is a third body. $O_3 + hv \rightarrow O_2 + O$ ($\lambda < 320 \text{ nm}$) (R3) $O_3 + O \rightarrow 2O_2$ $(\mathbf{R4})$ Odd oxygen *family* $[O_{v}] = [O_{3}] + [O]$ slow **R1** fast **R3 R4** slow **Courtesy of Daniel J. Jacob**

Chapman Mechanism: Compared to Observations



Water Vapor in Stratosphere

Aura MLS Equivalent Latitude/0 Global Section -- 6 Nov 2008 (2008d311)





Nitrous Oxide in the Stratosphere



Atmospheric Cycling of NO_x and NO_y



Stratospheric Ozone Budget for Midlatitudes Constrained by 1980s Space Shuttle Observations



Mid-latitude Stratospheric Ozone

