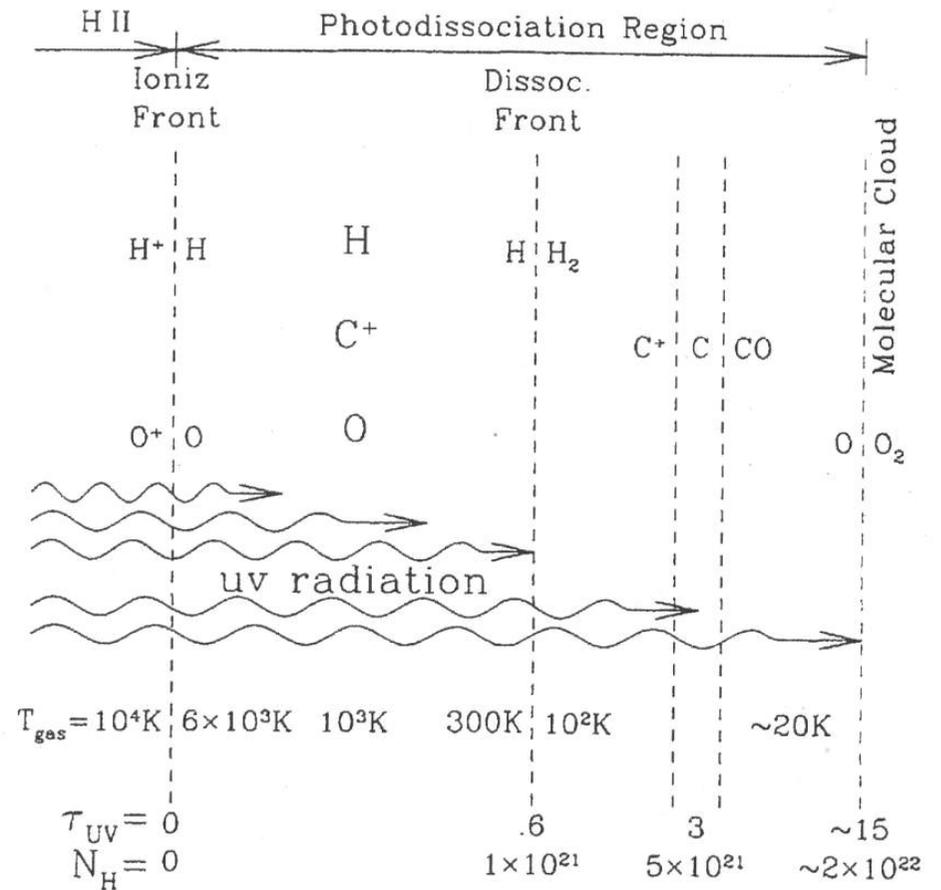
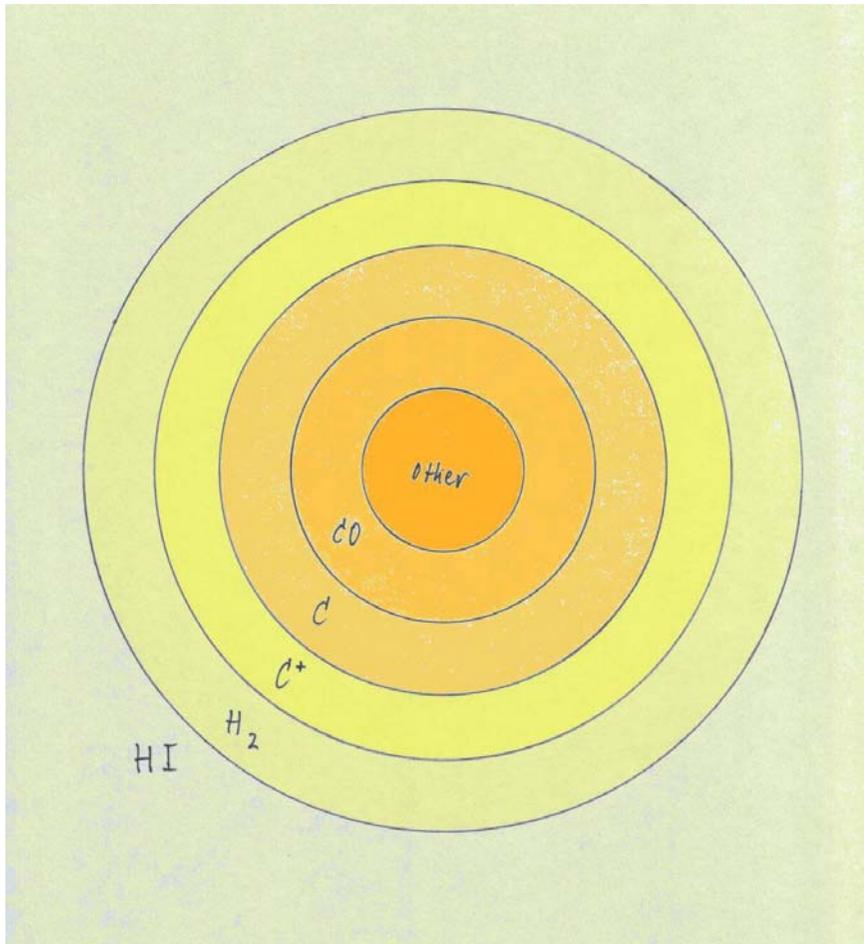


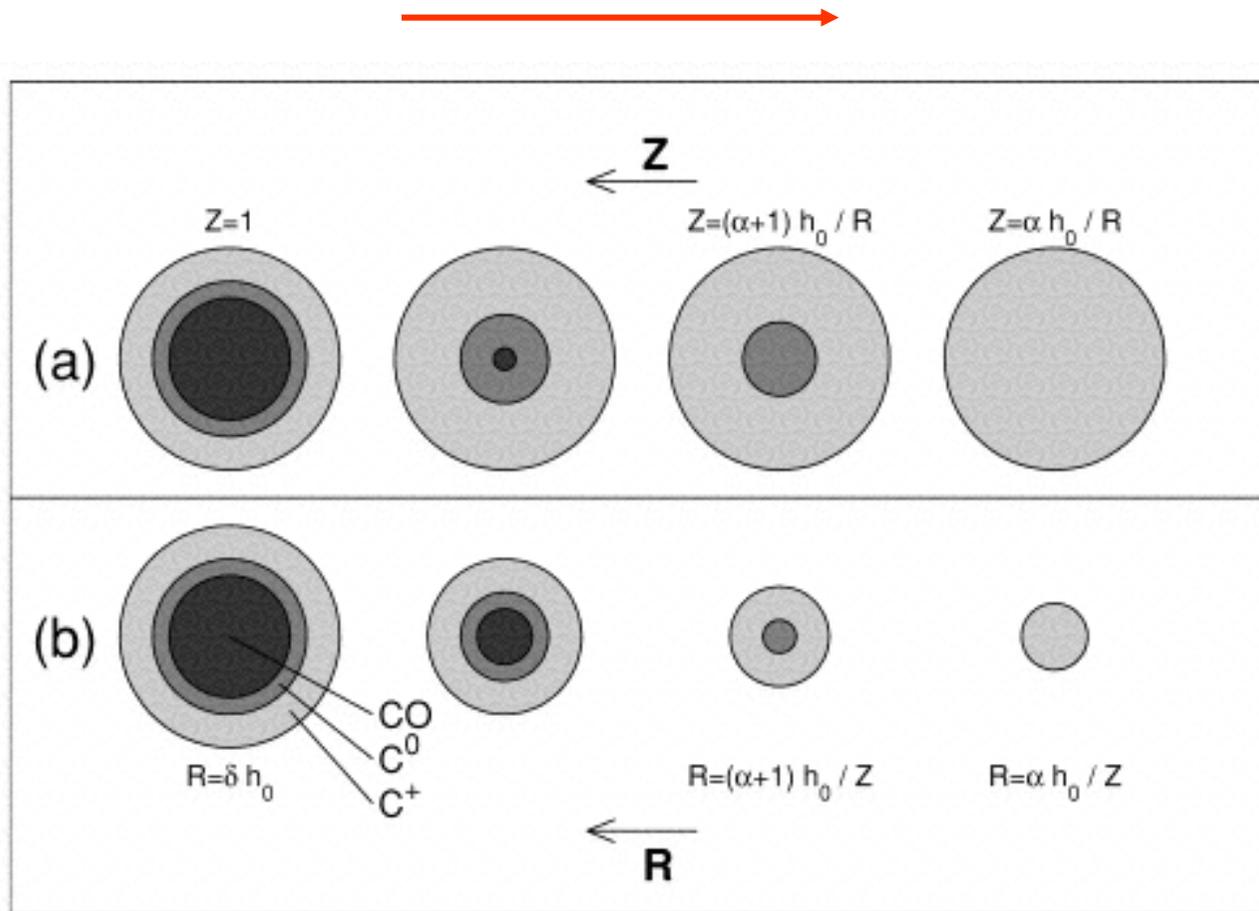
Photon-dominated regions

Structure of PDR



Photon-dominated regions

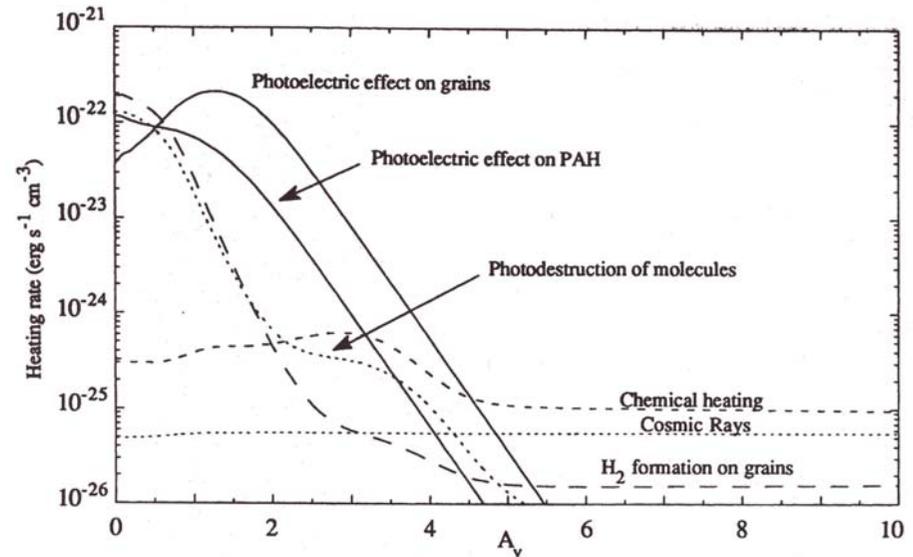
Constant radius, decreasing metallicity



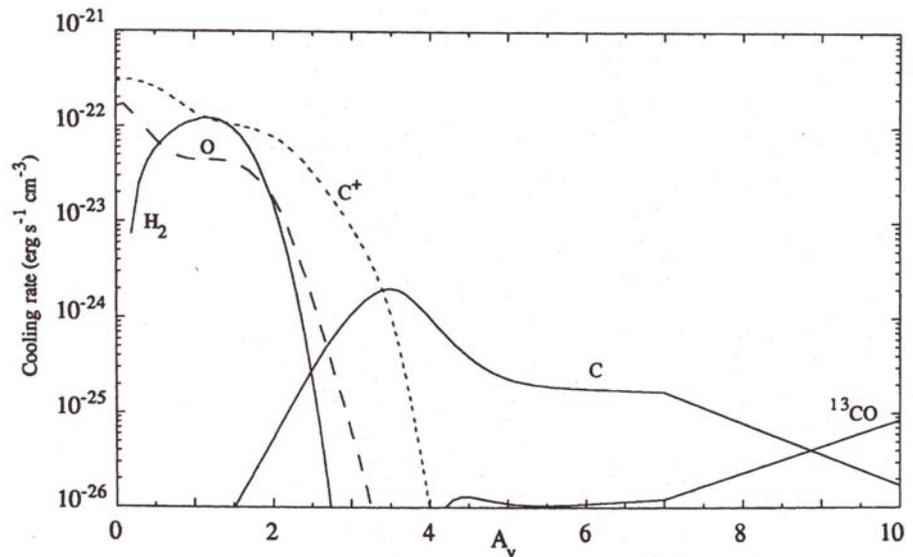
Constant metallicity, decreasing radius

Photon-dominated regions

relevant heating processes



relative importance of atomic species in heating



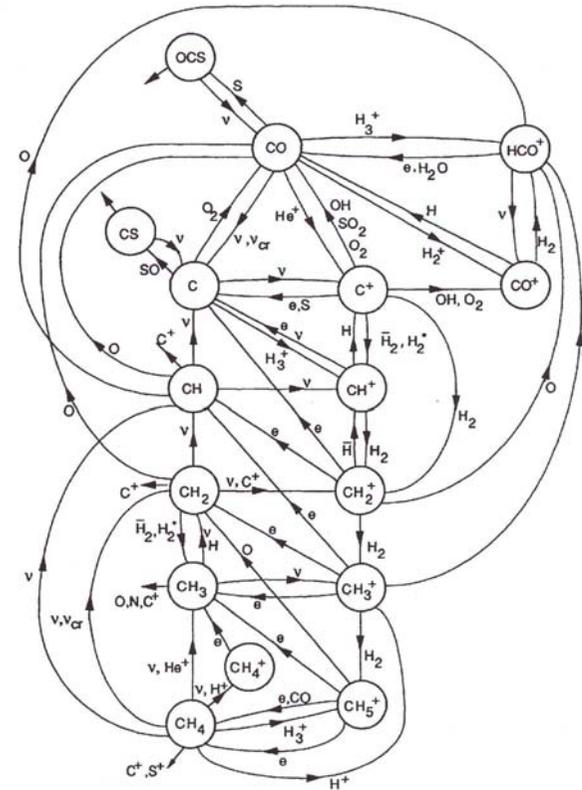
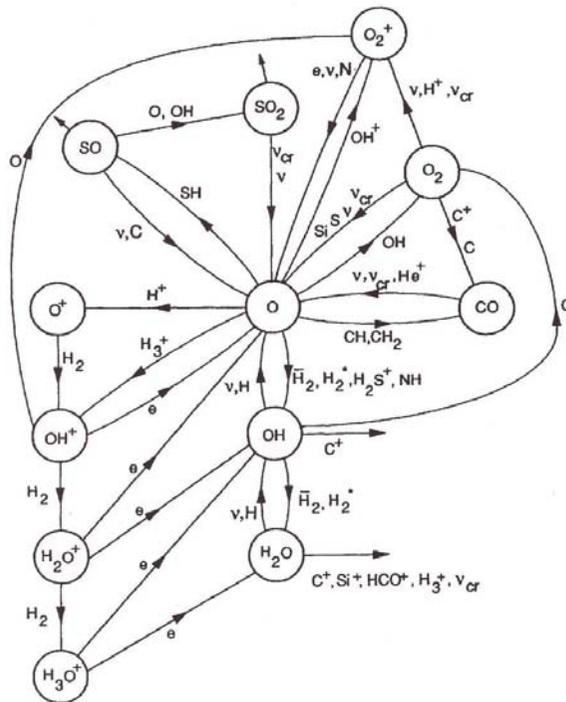
Photon-dominated regions

Chemical network of

oxygen

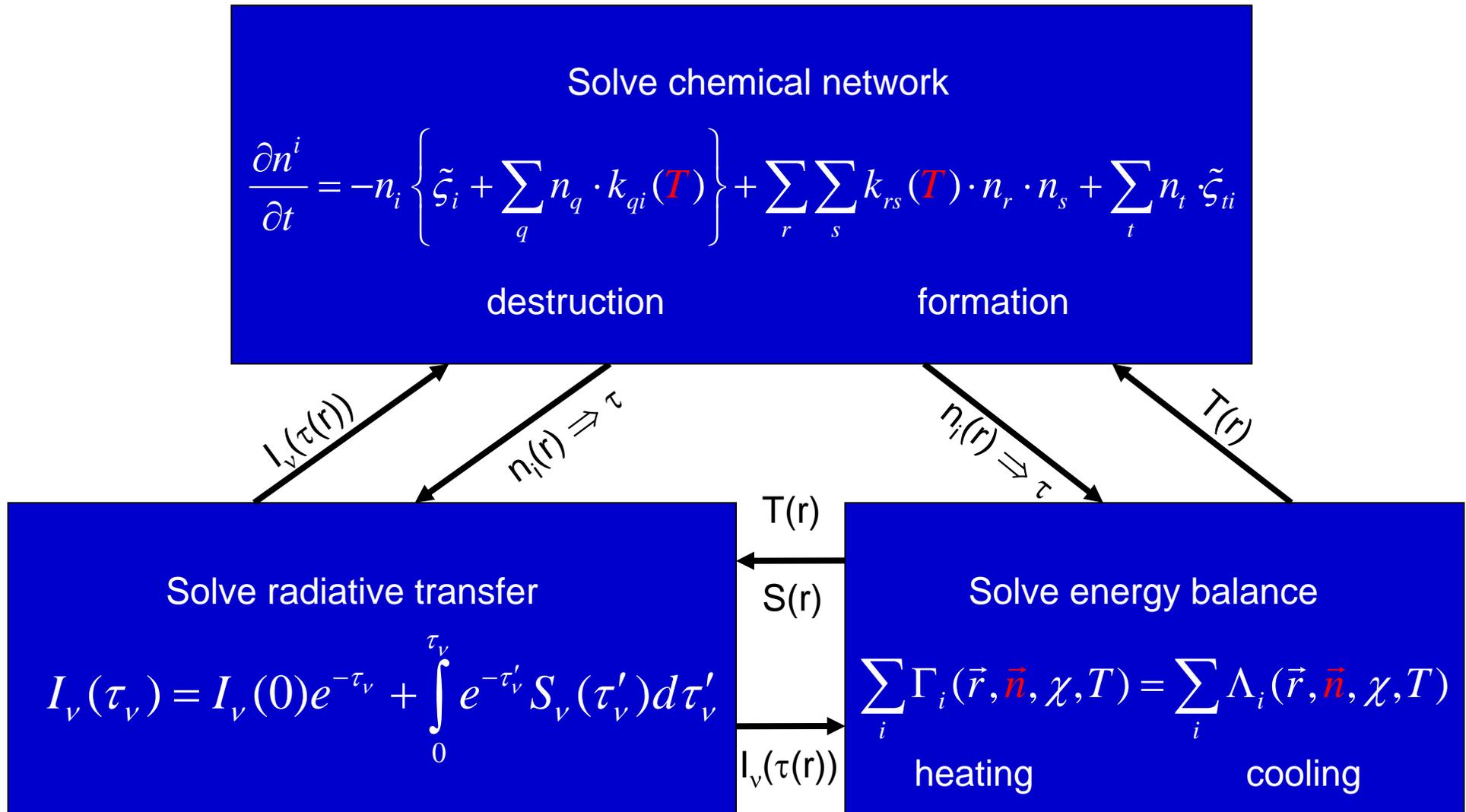
and

carbon



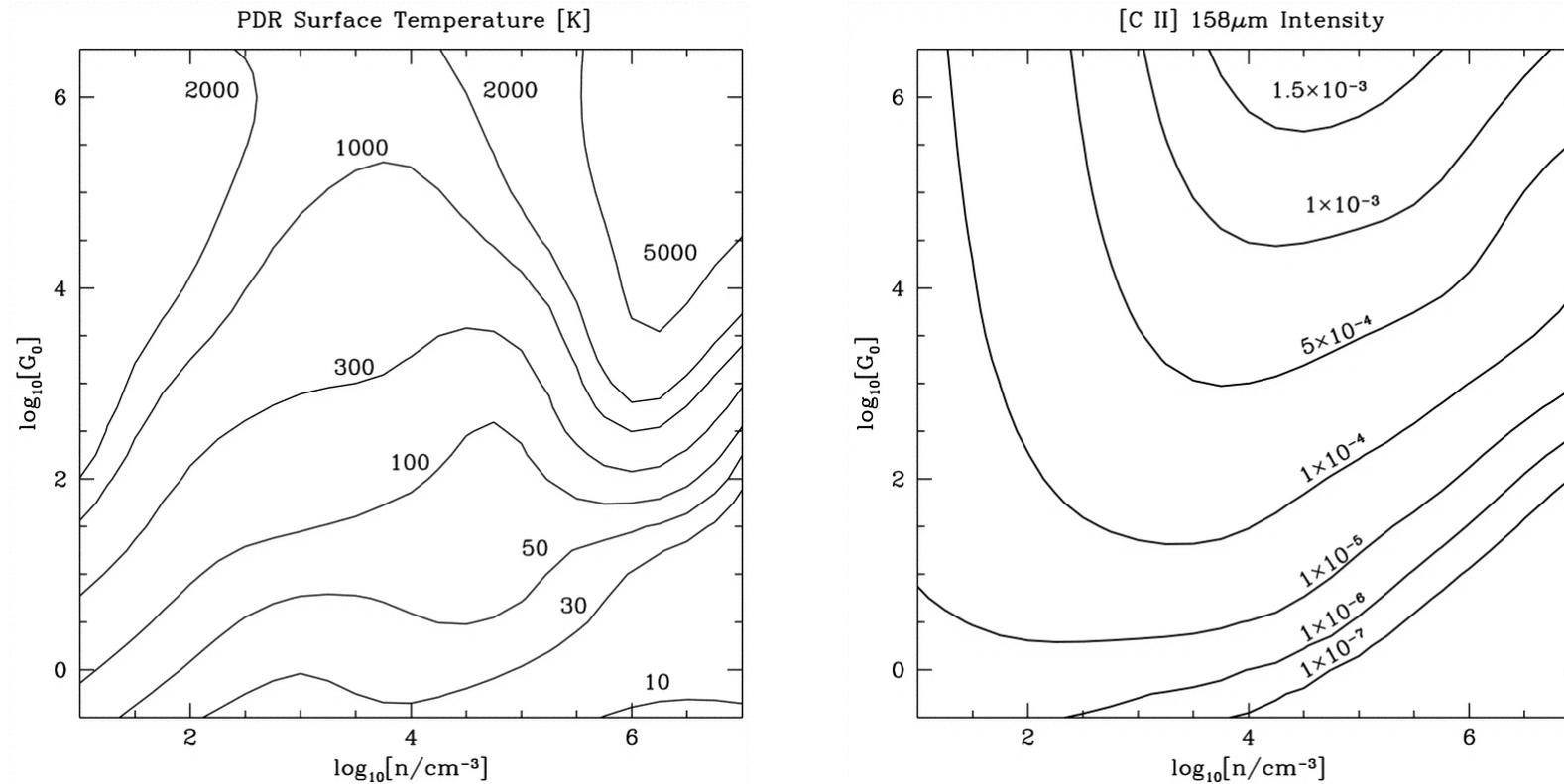
Photon-dominated regions

Solution scheme of PDR models



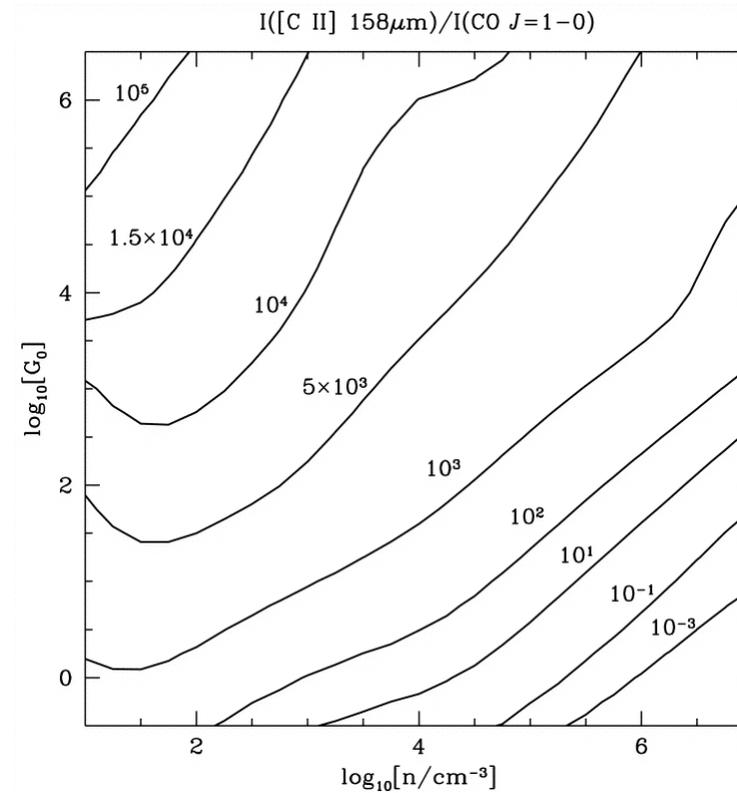
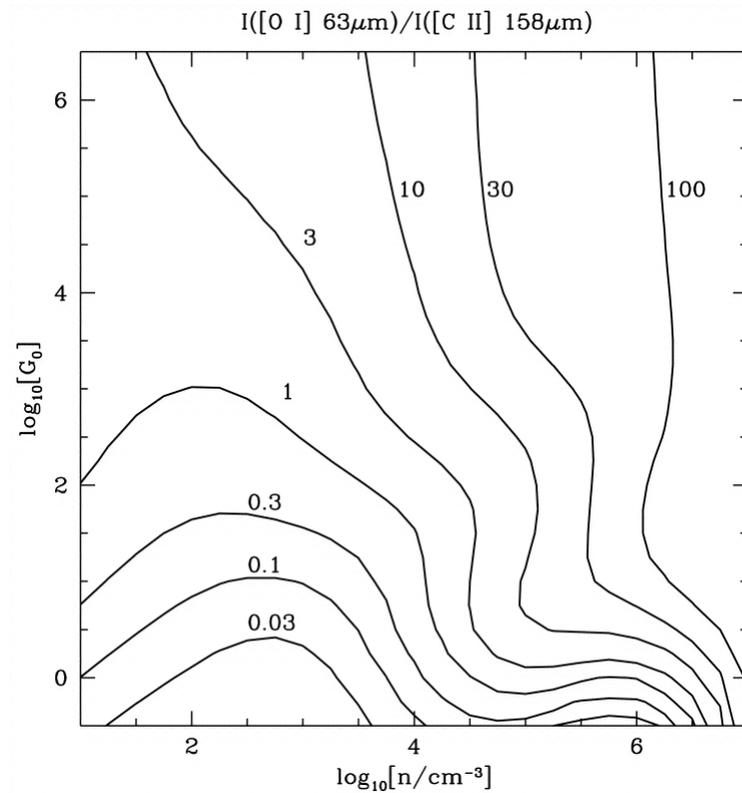
Photon-dominated regions

PDR properties as a function of radiation field and density



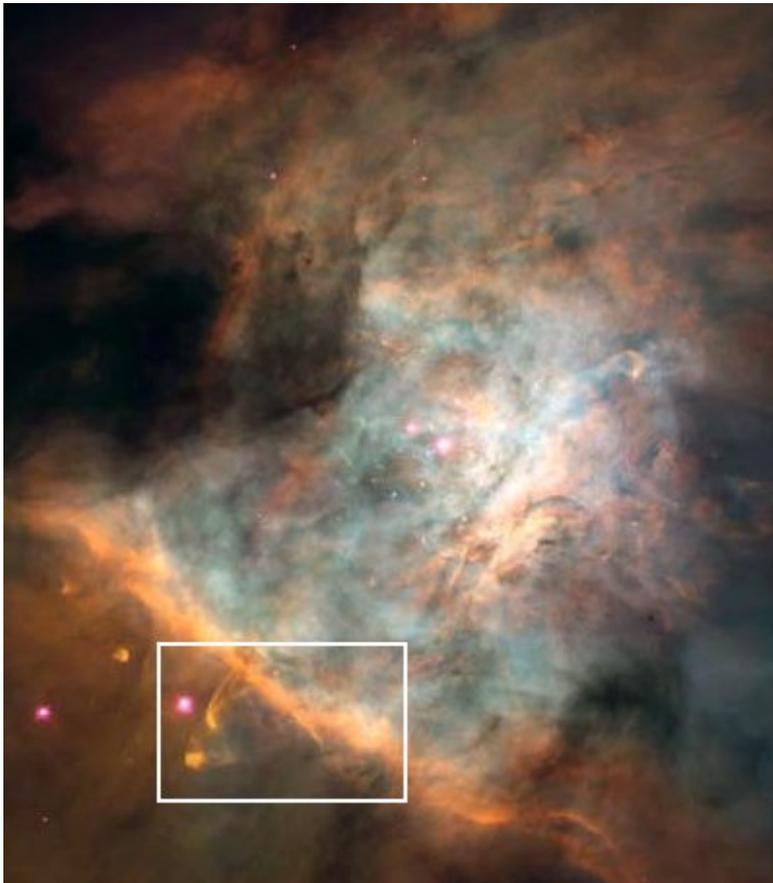
Photon-dominated regions

PDR properties as a function of radiation field and density

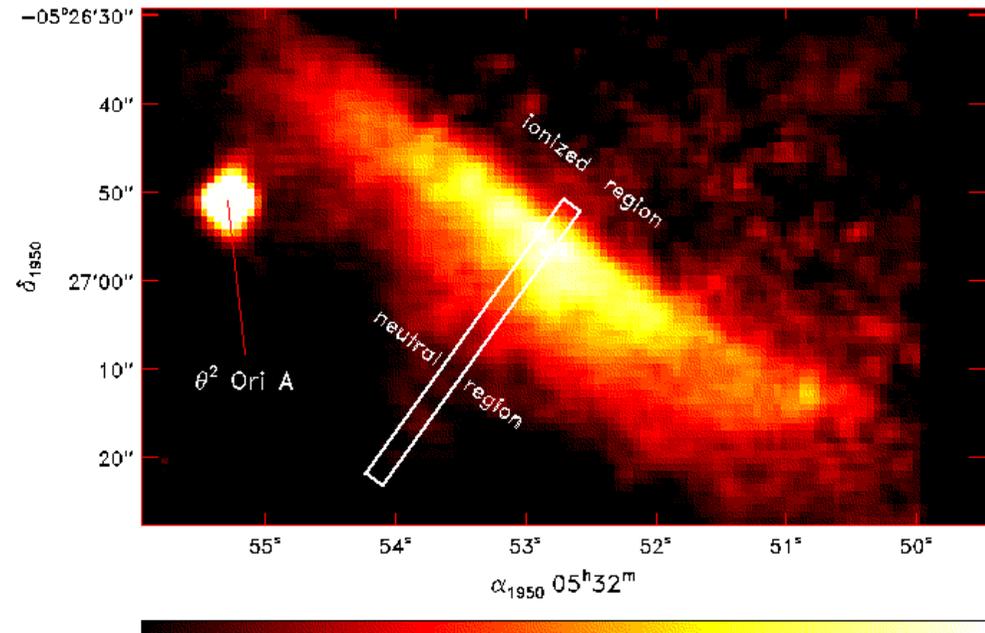


Photon-dominated regions

prototypical PDR: „Orion bar“



← HST image
FIR image (PAHs)
⇓



Photon-dominated regions

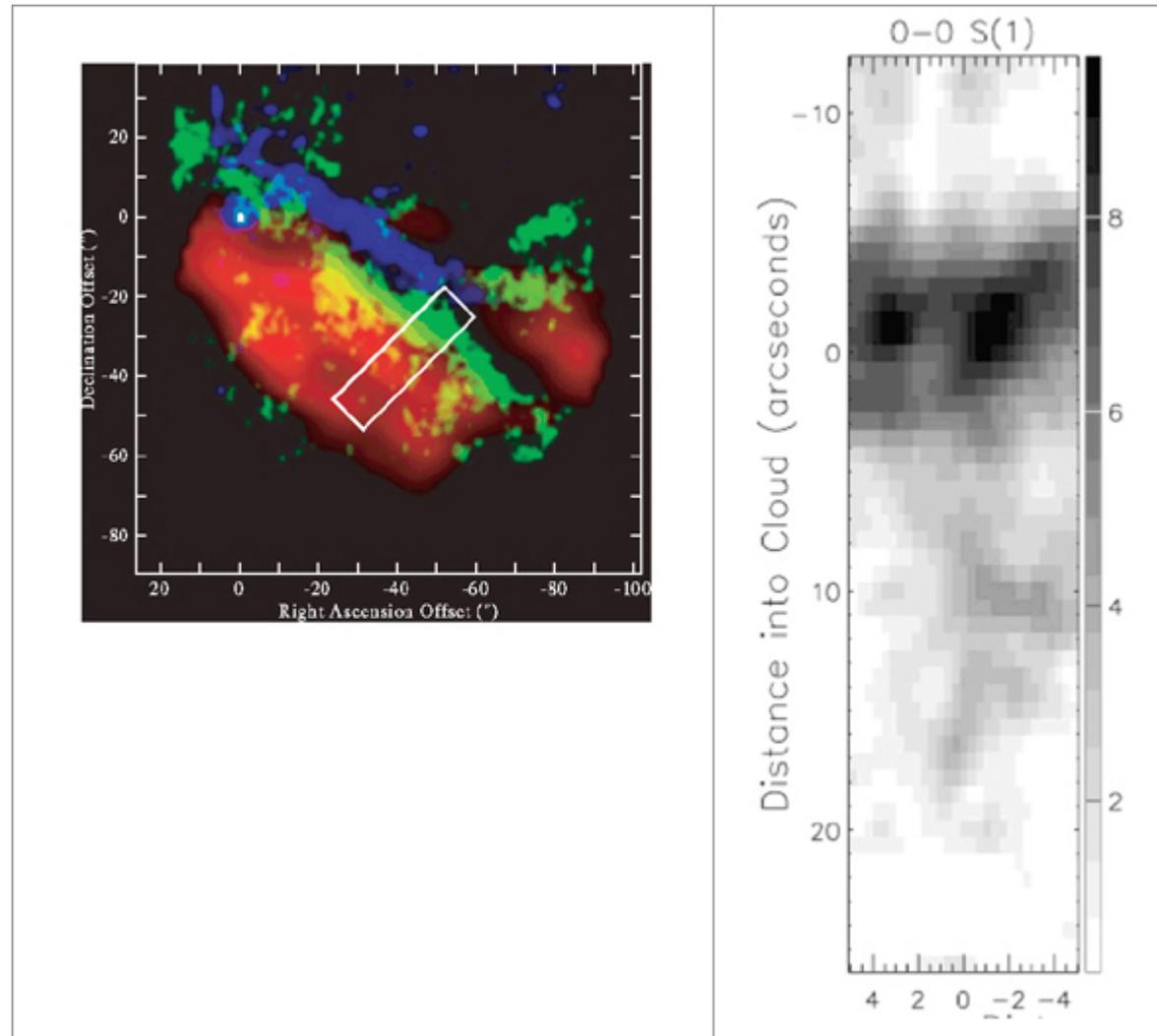
Orion bar

blue: PAH

red: CO

green/yellow: H₂

Intensity of vibrational line of H₂ observed in white box



Photon-dominated regions

Telescopes to study PDRs: SOFIA



- 2.5-m telescope
- $\sim 1 \mu\text{m} \dots 600 \mu\text{m}$
- altitude: 41000 ft. = 14300 m
- operation: \geq end of 2008

Photon-dominated regions

Telescopes to study PDRs: Herschel



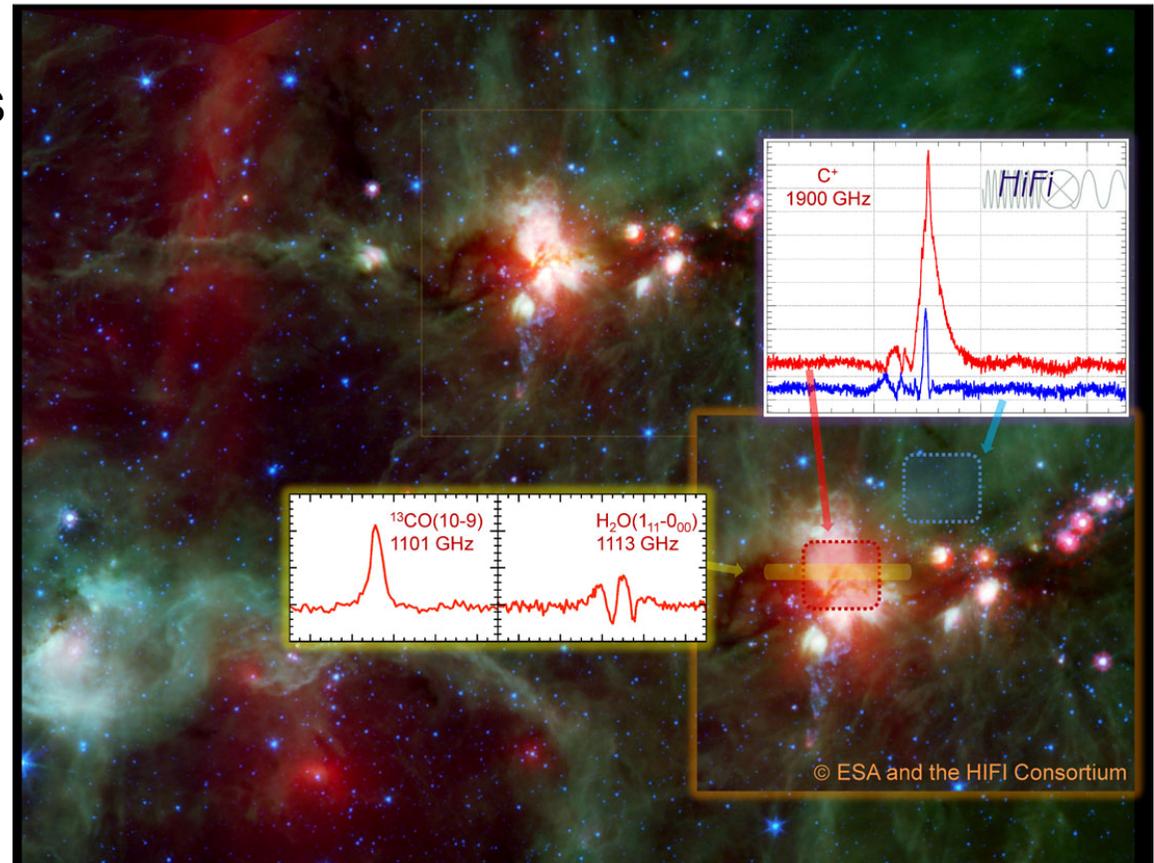
- 3.5-m telescope
- $\sim 60 \mu\text{m} \dots 670 \mu\text{m}$
- 2nd Lagrange point of sun-earth system
- launched in May (together with Planck)
- operation: ~ 3 years

Photon-dominated regions

Spitzer image of DR21 star forming region in false colours (IRAC 5.8 μm in blue and 8.0 μm in green, and MIPS 24 μm in red), the green reveals the emission from large molecules

Blue and red boxes: areas that have been surveyed for ionized carbon C^+ at 1900 GHz

The broad line at the position of the newly formed star (in red) reveals the presence of a powerful wind ripping the cloud apart. In contrast, the off-star position (in blue) shows emission from quiescent material, which has not (yet) been disturbed by this star.



Yellow stripe: region studied in lines of water (H_2O ($1_{11} \rightarrow 0_{00}$) at 1113 GHz, right) and carbon monoxide (^{13}CO ($10 \rightarrow 9$) at 1101 GHz, left) by HIFI.