

VEN

## RADIATIVE TRANSFER CODES CURRENTLY USED

### **The 5S code (*Tanré et al*)**

(Simulation of the Satellite Signal in the Solar Spectrum)  
Lambertian target, no target elevation, limited accuracy, etc...

### **The SOS code (*Deuzé et al*)**

(Successive Order of Scattering)

Accurate for scattering problems but suppose a knowledge of Radiative Transfer (CPU consuming)

### **The RadTran code (*Ahmad and Fraser*)**

(Successive Order of Scattering + approx of Gas transmission)

Accurate and roughly accurate for absorption but suppose a knowledge of Radiative Transfer (highly CPU consuming)

### **Monte Carlo (*Tanré et al*)**

(enable complete problem simulation)

(highly CPU consuming)

### **The 6S code (*Tanré et al*)**

(Second Simulation of the Satellite Signal in the Solar Spectrum)

In development & testing phase

(expected accuracy 5‰ Abs. Reflectance)

### **The Inversion Library (*Nakajima et al*)**

to invert SunPhotometer Network downward radiation measurements

In integration/testing phases

(cf Holben)

## **WHAT RADIATIVE SCHEME TO USE FOR THE OPERATIONAL A.C.?**

- Theoretical Error budget (*Tanré*)
- Testing on existing data: FIFE-ASAS,..(*Irons*)
- Synthetic database (*Kaufman*)
- Accuracy of the aerosol retrieval: Sun photometer network (*Holben*)

## **HOW TO HAVE AN IDEA OF THE A.C. OPERATIONAL PROCESS.?**

- Use the work which has been done before: SPOT4 (*Vermote*)
- Testing with satellite existing data: AVHRR (*Justice, Tucker*)
- The tropical belt project: application for AVHRR-GAC (*El Saleous*)
  - Relation with existing W.G.: OSS, Pathfinder, IGBP
  - Relation with other EOS instruments: MISR,..

## Relevant reference material available from code 923.GSFC

Holben et al: The Sunphotometer Network

Holben, B. N., Vermote, E., Kaufman, Y. J., Tanré, D. and Kalb, V., 1991, Aerosol Retrieval over Land from AVHRR data-Application for Atmospheric Correction. accepted in IEEE Transaction on Geoscience and Remote Sensing

Irons and al: Atmospheric correction of the FIFE data (in preparation)

Remer et al: The Wallops experiment

Prince et al: Use of 6S for A.C. of sahel temporal NDVI series (in preparation)

Tanré D., Deuzé J.L., Herman M., Santer R., Vermote E., "Second Simulation of the Satellite Signal in the Solar Spectrum (6S)" IGARSS'90 University of Maryland, College Park, May 20-24 pp187,1990

Vermote, E., Santer, R., Deschamps, P. Y. and Herman, M., 1991, In flight calibration of large field of view sensors at short wavelength using the Rayleigh scattering. accepted in L.J.R.S.

Vermote, E. F. and Tanré, D., 1991, Analytical Expressions for Radiative Properties of Planar Rayleigh Scattering Media Including Polarization Contribution. accepted in Journal Of Quantitative Spectroscopy and Radiative Transfer

Vermote, E. and D. Tanré - "Approach for considering altitude of sensor and target in remote sensing" to be submitted in Remote Sensing of Environment.

Vermote E. and D. Tanré "Satellite Signal simulation for ground directional reflectance" in preparation

Vermote E., Tanré D., Herman M. , "Atmospheric effects on satellite imagery. Correction algorithms for Ocean color or vegetation monitoring" MANAUS/ISPRS Published in Internationnal archives of photogrammetry and remote sensing, Vol 28, Part 1, pp46-55, 1990

Vermote E., Holben B.N., Kaufman Y., El Saleous N., Tucker C.J., "Global aerosol climatology over Tropical Belt using AVHRR data", to be presented at IRS 92.

Vermote E., Vasilliou G., Kaufman Y.J. and Holben B.N. "Calibration of the AVHRR visible and near IR channels using radiances measured over remote ocean areas" to be presented at IGARSS'92

## **Atmospheric Correction for MODIS**

### **Radiative Transfer Activities**

#### **INPUT:**

- raw data
- instrument data: calibration, spectral responses
- ancillary data: atmospheric gases, aerosols, BRDF, Digital Elevation Model (DEM)

#### **OUTPUT:**

- Atmosphere Corrected Reflectance
- Land Leaving Radiance

#### **ERROR BUDGET:**

- What is the required accuracy (eg the Land group)?
- What is the accuracy of the available input data? (aerosol optical properties, BRDF, calibration)
- What will be the accuracy of the output data? (Radiative Transfer Code, Tanré & others)