SORD: A New Open Source Vector RT Code

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INTRODUCTION = CONCLUSION

• New vector RT code SORD for atmospheric and terrestrial applications
• Method used: successive orders [1]
• Polarization: I, Q, U (no V negligible error)
• Distribution: open source
• Language: FORTRAN 90/95
• Accuracy: high (validation: 50 published benchmarks)
• Run-time: see numbers below
• Support and further development: sergey.v.korkin@nasa.gov

RESULTS FOR ACCURACY

"Point" – [SZA VZA AZA] in each particular scenario. E.g., a test with 1SZA x 10VZA x 5AZA = 50 different points. The total number of points is 16888 [3].

**RESULTS FOR RUN-TIME (NOTATION ON X-AXIS: TEST_ORDINATES_MICROLEYERS)***

Machine 1 (laptop): Intel i7-2720QM CPU 2.20GHz, Windows 7 64 bit; Intel Visual Fortran Compiler 11.0.072 integrated with Microsoft Visual Studio 2008. In Visual Studio, we enabled the “Maximum Speed” option located under Configuration Properties/FormntOptimization. Further, we refer to this machine by the compiler name, “ifort”.

Machine 2 (CPU on the AERONET server): Intel Xeon E7-4880 v2 CPU 2.8 GHz, Linux 2.6.64 bit; The Portland Group Fortran 90/95 compiler 7.1-4 with the following compiler keys: -O3 -Mipa=fast, inline = aggressive.

Figure 2 (above). Distribution of number of points over bins of relative error, in %, for I (left) and DoLP (right). Note: DoLP converges faster.

Figure 3 (right). Maximum (red) and average (blue) absolute values of relative errors for each tolerance (100 points per bin) and DoLP (bottom row) in each test. Right column shows a few points with higher error (cloud cases, at horizon).

NOT YET PUBLISHED RESULTS

IPRT tests [5] with dust + gas absorption + Rayleigh profiles: Test 450 – 30 layers

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• We are thankful to Drs. Pavel Litvinov and Oleg Dubovik for making their successive orders of scattering RT code [8-4] available to us.

REFERENCES


**ACCUACY PARAMETERS**

Intensity, I as usual (B – benchmark, S – SORD)

\[ I = 100\% \times I / I_0 \]

DoLP, P (DoLP omits the signs of Q and U)

\[ P = \sqrt{Q^2 + U^2} / I \]

\[ 0 \leq P = \sqrt{Q^2 + U^2} / I \leq 1 \]

\[ \Delta P = 100\% \times P - P_0 \]

\[ \Delta P = 100\% \times (P - P_0) \]

Accuracy requirement from instrument [3] and retrieval algorithm [4], and our targeted accuracy – SAME FOR P and P2

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