

Supplement

The following tables show the percentage of GOME-2A (Table S1), GOME-2B (Table S2) and GOME-2C (Table S3) data that fall within the different requirement thresholds, for the different aerosol species defined by CALIOP. It can be seen that there is a clear difference between the different aerosol species. The agreement with CALIOP pixels classified as clean marine, polluted and clean continental aerosols is clearly better than for the other aerosol species as more pixels fall within the optimal thresholds compared to other aerosol species (dust, polluted dust and the stratospheric aerosols).

Table S1: Percentage of GOME-2A data that reached the threshold, target and optimal requirements (sorted by aerosol type).

GOME-2A: clean marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	87 %	No data
	AAH-maxC	93.3 %	No data
Target	AAH-minC	80.3 %	No data
	AAH-maxC	86.5 %	No data
Optimal	AAH-minC	69.5 %	No data
	AAH-maxC	39.5 %	No data
GOME-2A: dust			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	78.1 %	100 %
	AAH-maxC	76.7 %	100 %
Target	AAH-minC	57.7 %	100 %
	AAH-maxC	58.4 %	100 %
Optimal	AAH-minC	25.1 %	80 %
	AAH-maxC	31.1 %	100 %
GOME-2A: polluted continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	78.1 %	No data
	AAH-maxC	93.0 %	No data
Target	AAH-minC	74.1 %	No data
	AAH-maxC	77.2 %	No data
Optimal	AAH-minC	68.4 %	No data
	AAH-maxC	40.8 %	No data
GOME-2A: clean continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	87.5 %	No data
	AAH-maxC	75.0 %	No data
Target	AAH-minC	58.8 %	No data
	AAH-maxC	58.8 %	No data
Optimal	AAH-minC	56.3 %	No data
	AAH-maxC	55.0 %	No data
GOME-2A: polluted dust			
		Layer height <10 km	Layer height >10 km

Threshold	AAH-minC	57.2 %	66.7 %
	AAH-maxC	65.2 %	66.7 %
Target	AAH-minC	32.1 %	66.7 %
	AAH-maxC	34.5 %	66.7 %
Optimal	AAH-minC	9.2 %	66.7 %
	AAH-maxC	7.2 %	66.7 %
GOME-2A: smoke			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	94 %	No data
	AAH-maxC	67.1 %	No data
Target	AAH-minC	60.8 %	No data
	AAH-maxC	25.4 %	No data
Optimal	AAH-minC	12.4 %	No data
	AAH-maxC	15.2 %	No data
GOME-2A: dusty marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	85.1 %	No data
	AAH-maxC	89.1 %	No data
Target	AAH-minC	59.4 %	No data
	AAH-maxC	69.7 %	No data
Optimal	AAH-minC	40.0 %	No data
	AAH-maxC	49.7 %	No data
GOME-2A: volcanic ash			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0 %	59.3 %
	AAH-maxC	0 %	28.1 %
Target	AAH-minC	0 %	28.3 %
	AAH-maxC	0 %	10.9 %
Optimal	AAH-minC	0 %	12.0 %
	AAH-maxC	0 %	2.2 %
GOME-2A: sulfate			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0 %	No data
	AAH-maxC	0 %	No data
Target	AAH-minC	0 %	No data
	AAH-maxC	0 %	No data
Optimal	AAH-minC	0 %	No data
	AAH-maxC	0 %	No data
GOME-2A: elevated smoke			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0 %	61.9 %
	AAH-maxC	0 %	52.4 %
Target	AAH-minC	0 %	14.3 %
	AAH-maxC	0 %	9.5 %
Optimal	AAH-minC	0 %	9.5 %
	AAH-maxC	0 %	0 %

Table S2: Percentage of GOME-2B data that reached the threshold, target and optimal requirements (sorted by aerosol type).

GOME-2B: clean marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	39.8	No data
	AAH-maxC	39.8	No data
Target	AAH-minC	38.7	No data
	AAH-maxC	34.6	No data
Optimal	AAH-minC	28.1	No data
	AAH-maxC	28.3	No data
GOME-2B: dust			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	44.3	100
	AAH-maxC	48.1	100
Target	AAH-minC	37.1	40
	AAH-maxC	33.2	100
Optimal	AAH-minC	20.6	40
	AAH-maxC	17.6	40
GOME-2B: polluted continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	72.5	0
	AAH-maxC	75.2	0
Target	AAH-minC	71.4	0
	AAH-maxC	64.5	0
Optimal	AAH-minC	56.5	0
	AAH-maxC	43.5	0
GOME-2B: clean continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	85.7	No data
	AAH-maxC	85.7	No data
Target	AAH-minC	85.7	No data
	AAH-maxC	85.7	No data
Optimal	AAH-minC	69.6	No data
	AAH-maxC	58.9	No data
GOME-2B: polluted dust			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	52	0
	AAH-maxC	50.7	0
Target	AAH-minC	37.9	0
	AAH-maxC	31.5	0
Optimal	AAH-minC	22.8	0
	AAH-maxC	15.8	0
GOME-2B: smoke			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	77.1	No data
	AAH-maxC	64.2	No data
Target	AAH-minC	66.3	No data
	AAH-maxC	43.1	No data
Optimal	AAH-minC	42.9	No data
	AAH-maxC	17.6	No data

GOME-2B: dusty marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	67.8	No data
	AAH-maxC	53.6	No data
Target	AAH-minC	64.8	No data
	AAH-maxC	12.4	No data
Optimal	AAH-minC	42.1	No data
	AAH-maxC	8.2	No data
GOME-2B: volcanic ash			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0	100
	AAH-maxC	0	66.5
Target	AAH-minC	0	73.9
	AAH-maxC	0	57.1
Optimal	AAH-minC	0	42
	AAH-maxC	0	22.9
GOME-2B: sulfate			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0	75.8
	AAH-maxC	0	75.8
Target	AAH-minC	0	75.8
	AAH-maxC	0	72.7
Optimal	AAH-minC	0	27.3
	AAH-maxC	0	72.7
GOME-2B: elevated smoke			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0	100
	AAH-maxC	0	90.9
Target	AAH-minC	0	100
	AAH-maxC	0	72.7
Optimal	AAH-minC	0	27.3
	AAH-maxC	0	36.4

15 Table S3: Percentage of GOME-2C data that reached the threshold, target and optimal requirements (sorted by aerosol type).

GOME-2C: clean marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	70	No data
	AAH-maxC	72.4	No data
Target	AAH-minC	53.4	No data
	AAH-maxC	64.9	No data
Optimal	AAH-minC	41.5	No data
	AAH-maxC	43.3	No data
GOME-2C: dust			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	69.3	No data
	AAH-maxC	69.3	No data
Target	AAH-minC	58.3	No data
	AAH-maxC	62.5	No data
Optimal	AAH-minC	46.4	No data
	AAH-maxC	51.0	No data
GOME-2C: polluted continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	87.7	No data
	AAH-maxC	100	No data
Target	AAH-minC	58.9	No data
	AAH-maxC	100	No data
Optimal	AAH-minC	57.5	No data
	AAH-maxC	58.9	No data
GOME-2C: clean continental			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	100	No data
	AAH-maxC	100	No data
Target	AAH-minC	100	No data
	AAH-maxC	100	No data
Optimal	AAH-minC	100	No data
	AAH-maxC	33.3	No data
GOME-2C: polluted dust			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	37.3	No data
	AAH-maxC	39.5	No data
Target	AAH-minC	23.3	No data
	AAH-maxC	9.3	No data
Optimal	AAH-minC	14	No data
	AAH-maxC	7.0	No data
GOME-2C: smoke			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	84.8	No data
	AAH-maxC	84.8	No data
Target	AAH-minC	66.7	No data
	AAH-maxC	69.7	No data
Optimal	AAH-minC	36.4	No data
	AAH-maxC	24.2	No data

GOME-2C: dusty marine			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	100	No data
	AAH-maxC	100	No data
Target	AAH-minC	100	No data
	AAH-maxC	100	No data
Optimal	AAH-minC	93.3	No data
	AAH-maxC	93.3	No data
GOME-2C: volcanic ash			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0	No data
	AAH-maxC	0	No data
Target	AAH-minC	0	No data
	AAH-maxC	0	No data
Optimal	AAH-minC	0	No data
	AAH-maxC	0	No data
GOME-2C: sulfate			
		Layer height <10 km	Layer height >10 km
Threshold	AAH-minC	0	No data
	AAH-maxC	0	No data
Target	AAH-minC	0	No data
	AAH-maxC	0	No data
Optimal	AAH-minC	0	No data
	AAH-maxC	0	No data