ASTER Product Notes

Geoscience Products

Product (GeoTIFFs)	**Base algorithm** B=band No. = ASTER band No.	**Filters**	**Stretch lower limit**	**Stretch upper limit**	**Stretch type**	**Accuracy**
ASTER False colour (green = green vegetation)	Red: B_6 Green: B_3 Blue: B_1	none	N/A	N/A	linear	N/a. Apparent miscalibration between scenes is largely a function of differences in vegetation type/content.
ASTER Natural colour (red = green vegetation)	Red: B_3 Green: B_2 Blue: B_1	none	N/A	N/A	linear	N/a. Apparent miscalibration between scenes is largely a function of differences in vegetation type/content.
ASTER Green vegetation content	B_3/B_2	none	1.8 Blue is low content Black is below the threshold	3 Red is high content	linear	Moderate: Complicated by residual atmospheric aerosols effects and iron oxides. Note also strong seasonal affects to the type (green versus dry) and abundance of vegetation cover which can not be easily unmixed, especially given the relatively low spectral resolution of ASTER, which does not comprise any suitable bands for measuring dry vegetation content (e.g. cellulose at 2080 nm).
ASTER Ferric oxide content (hematite, goethite)	B_4/B_3	Composite mask* Median filter 3x3	1.1 Blue is low abundance Black is below the threshold	1.5 Red is high abundance	linear	Low: Complicated by dry vegetation (mixing effect) and lack of suitable bands positioned in the VNIR to capture diagnostic ferric oxide spectral signatures. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER Ferrous iron content in silicates/ carbonates (actinolite, chlorite, ankerite, siderite)	B_5/B_4	Composite mask* Median filter 3x3	0.67 Blue is low abundance Black is below the threshold	0.82 Red is high abundance	linear	Moderate: Complicated by fire scars (carbon black in ash) and lack of dry plant material. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER Opaques	B_1/B_4	Composite mask*	0.43	0.60	linear	Moderate: Complicated by mixtures with vegetation and

(potentially includes sulphides, carbon black (eg, ash), magnetite, Mn oxides)		+ B_4 <43 Median filter 3x3	Blue is low abundance Black is below the threshold	Red is high abundance		dependent on the albedo of mineral mixtures endmembers and residual errors associated with: (1) masking out cloud shadows and other dark non geologic pixels, (2) accurate correction for aerosol scattering, and (3) iron oxide poor bright targets that in theory would be masked by the <25% albedo but may be in partial "shadow".
ASTER AlOH group content (illite, phengite, muscovite, Al-smectite, kaolinite)	$(B_5+B_7)/B_6$	Composite mask* Median filter 3x3	1.67 Blue is low abundance Black is below the threshold	1.85 Red is high abundance	linear	Moderate: Complicated by mixing with green/dry plant materials. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER AlOH group composition (phengite red to kaolinite blue)	B_5/B_7	Composite mask* + $(B_5+B_7)/B_6$>1.67 Median filter 3x3	0.71 Blue is kaolinite and/or muscovite or paragonite	1.05 Red is phengite	equalised	Low: Phengite information compromised by minerals such as chlorite and carbonate while muscovite/paragonite/kaolinite is comprised by mixtures with pyrophyllite and alunite and some types of dry plant material. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER Kaolin group (pyrophyllite, alunite and kaolinite)	B_6/B_5	Composite mask* Median filter 3x3	1.26 Blue is low content Black is below the threshold	1.48 Red is high content	linear	Low: Complicated by dry plant material (cellulose) and AlOH poor areas dominated by "mafic" minerals. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER FeOH group content (chlorite, epidote, jarosite, nontronite)	$(B_6+B_8)/B_7$	Composite mask* Median filter 3x3	2.15 Blue is low content Black is below the threshold	2.4 Red is high content	linear	Low: Complicated by carbonate (magnesite, dolomite), vegetation, gibbsite, opal/chalcedony. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER MgOH group content (calcite, dolomite, magnesite, chlorite, epidote, amphibole, talc, serpentine)	$(B_6+B_9)/(B_7+B_8)$	Composite mask* Median filter 3x3	0.95 Blue is low content Black is below the threshold	0.99 Red is high content	linear	Low: Complicated by absorption related to dry vegetation (reddens) white mica as well as residual inaccuracies in instrument "crosstalk" correction, especially for band 9. Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER MgOH group composition	B_7/B_8	Composite mask* + MgOH content	0.86 Blue is dolomite,	1.06 Red is calcite,	equalised	Low: Complicated by dry vegetation (more dry vegetation produces redder tones) and any contribution form MgOH

(calcite, dolomite, talc, amphibole, epidote, chlorite)		>0.95 Median filter 3x3	chlorite, talk Black is below the threshold	epidote		minerals like talc, amphibole, serpentine, magnesite and tricoctahedral clays as well as any residual inaccuracies in instrument "crosstalk" correction.
ASTER ferrous iron content in MgOH carbonate (Fe-chlorite, actinolite, siderite, ankerite) often useful for mapping mafic rocks	B_5/B_4	Composite mask* + MgOH content >0.95 Median filter 3x3	0.5 Blue is low ferrous iron content in carbonate and MgOH minerals like chlorite and amphibole. Black is below the threshold	0.8 Red is high ferrous iron content in carbonate and MgOH minerals like chlorite and amphibole.	equalised	Low: Complicated by vegetation and any inaccuracies in the MgOH content mask product (see above). Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER ferric iron content in MgOH carbonate (hematite, goethite)	B_4/B_3	Composite mask* + MgOH content >0.95 Median filter 3x3	0.7 Blue is low ferric iron (e.g. iron oxide) in carbonate and MgOH minerals like chlorite and amphibole. Black is below the threshold.	1.45 Red is high ferric iron content in carbonate and MgOH minerals like chlorite and amphibole.	equalised	Low: Complicated by vegetation and any inaccuracies in the MgOH content mask product (see above). Vegetation masks have not been able to remove all veg response which interferes with this product.
ASTER Silica (Si-rich minerals, such as quartz, feldspars, Al-clays)	B_{13}/B_{10}	Composite mask* Median filter 3x3	1.35 Blue is low silica content.	1.41 Red is high silica content.	linear	Low: Strongly affected by particle size and regolith affects. For example, alluvial/colluvial materials generally show high values compared to outcrop because of the abundance of clean (resistant) quartz grains. Fine particle size (sub 250 micron) produces low responses. Also compromised by green (blackbody) and dry vegetation. Affected by discontinuous line-striping.
ASTER Carbonate (calcite, dolomite, magnesite, siderite, ankerite)	B_{13}/B_{14}	Composite mask* Median filter 3x3	0.958 Blue is low carbonate content.	0.97 Red is high carbonate content.	linear	Low: Should be combined with the MgOH content to help confirm the presence of carbonate. Green (blackbody) and dry vegetation affects also. Potentially compromised by spectrally flat materials (possibly burnt areas?). Affected by discontinuous

						line-striping.
ASTER Quartz index	$B_{11}/(B_{10}+B_{12})$	Composite mask* Median filter 3x3	0.502 Blue is low quartz content.	0.507 Red is high quartz content.	linear	Low: Affected by discontinuous line striping. Relatively unaffected by particle size. Best used as a discriminator of quartz rather than as a measure of quartz content.
ASTER mafic group (pyroxenes, garnets, epidote, chlorite)	B12/B13	Composite mask* Median filter 3x3	0.852 Blue is low mafic mineral content.	0.872 Red is high mafic mineral content.	linear	Low: Strongly complicated by dry vegetation and often inversely correlated with Si-rich mineralogy/rocks.

* Composite mask comprises:
(1) green vegetation **out** : ratio of bands 3/2 >1.8; and
(2) low albedo (shadows, water) ***out***: reflectance Band 4<23 (12% reflectance).

References

- Hewson, R.D., Cudahy, T.J., Mizuhiko S., Ueda, K., Mauger, A.J., 2005. Seamless geological map generation using ASTER in the Broken Hill-Curnamona province of Australia. *Remote Sensing of Environment*, 99, pp. 159–172.
- Cudahy, T.J., Jones, M., Thomas, M., Laukamp, C., Caccetta, M., Hewson, R.D., Rodger, A.D. and Verrall, M., 2008. Next Generation Mineral Mapping: Queensland Airborne HyMap and Satellite ASTER Surveys 2006-2008. CSIRO report P2007/364, 153 pages (http://c3dmm.csiro.au)
- Ninomiya, Y., Fu, B., and Cudahy, T. J., 2005. Detecting lithology with Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) multispectral thermal infared “radiance-at-sensor” data. *Remote Sensing of Environment*, 99, pp. 127-139.

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