### OLI Bias Removal

#### Background

Conversion to radiance (L1R) occurs in 3 steps: bias removal; response linearization; and gain (absolute and relative) application. This algorithm addresses the first step in generating the L1R radiance product, removing bias. Applying gain and linearizing the detector response are addressed in separate algorithms. Bias removal is accomplished by subtracting a value (in DN) from each pixel of the input image. This value varies by detector for all bands, and also by frame.

Options to select between a CPF bias and biases derived from shutter data acquired near the collect are available for special processing. An option for bias temperature sensitivity correction (described in a separate algorithm) is applied within this algorithm.

#### Input

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptions** | **Level** | **Source** | **Type** |
| Scene (L0R) | Nbands, x NSCAs x NDetectors x NLines | L0R | Float |
| Per line correction | Nbands, x NSCAs x NDetectors x NLines | Bias Determination | Float |
| Per detector correction\* | (Nbands,+1)x NSCAs x NDetectors  | CPF | Float |
| Temperature Correction Factor (CFT – Unitless) | Nbands, x NSCAs x NDetectors | Temperature Sensitivity Correction | Float |

\*(Nbands+1) accounts for the pan band being separated into odd and even detectors

#### Output

|  |  |  |  |
| --- | --- | --- | --- |
| **Descriptions** | **Level** | **Target** | **Type** |
| Bias Corrected Scene  | Nbands, x NSCAs x NDetectors x NLines | Response Linearization | Float |
| Choice of Bias | 1 | L1R Metadata | String |
| Temperature Sensitivity Correction Flag | 1 | L1R Metadata | Integer |

#### Options

* Apply temperature sensitivity correction (default off)
* Choice of bias
	+ From CPF
	+ From bias determination algorithm (default)

#### Procedure

For each band, SCA, detector and line

1. If temperature sensitivity correction is selected, multiply the temperature correction factor *CFT* by the corresponding bias*.* 

  (1)

where *b* is band, *s*  is SCA, *d* is detector, and *f* is line, and if the bias is to come from the CPF, then *f* in (1) is one.

1. Subtract the per-line or per-detector bias from the corresponding input scene pixel. If temperature sensitivity correction is selected, use (2). Otherwise, use (3).

  (2)

  (3)

where *Q* is the input scene data *Q’* is the output bias corrected scene data, and if the bias is to come from the CPF, then *f* in *b* and *b’* in (2) and (3) is one.

#### Maturity

Level 2 (ALIAS reuse)

The only difference between this algorithm and the algorithm used in ALIAS is the per-line biases. Depending on OLI test data, this may or may not be needed operationally. If per-line biases are not needed, this algorithm will be simplified by removing the line variables in equation (1) and (2).

The temperature correction factor may also be changed to be additive, or possibly both a multiplicative and additive term may be needed.