Collection 5 Changes in the V5 PGE16

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The major collection 5 changes made in the V5 daily LST code (PGE16) are summarized in Table 1. These refinements significantly improved the spatial coverage of LSTs, especially in highland regions as shown in Fig. 1, and the accuracy and stability of the MODIS LST products. Comparisons between V5 LSTs and in-situ values in 47 clear-sky cases (in the LST range from $-10^{o}C$ to $58^{o}C$ and atmospheric column water vapor range from 0.4 to 3.5cm) indicate that the accuracy of the MODIS LST product is better than 1K in most cases (39 out of 47) and the root of mean squares of differences is less than 0.7K for all 47 cases or 0.5K for all but the 8 cases apparently with thin cirrus clouds. An example of the empirical optical-leak correction to band 32, the last change listed in Table 1, is shown in Fig. 2, the image of the night LSTs in MOD11A1.A2003194.h11v05 before the correction is on left side and the one after the correction is on the right side.

Table 1, major refinements implemented in the V5 daily LST code (PGE16).

| Specification / Action	in V4	in V5
grid size of LST/emissivities in M*D11B1 retrieved from day/night algorithm	5km x 5km (exactly 4.63km)	6km x 6km (exactly 5.56km)
number of sub-ranges of zenith view angles	5 for the whole scan swath	2x8 for the whole scan swath
effect of slope in the M*D11B1 grid	not considered	considered in the QA
temporal averaging in the 1km LST product	yes	no
option of combined use of Terra and Aqua data in the day/night algorithm	no	yes
incorporate the split-window method into the day/night algorithm	partially with landcover-based em31, em32 and initial Ta,cwv	fully with em31, em32, Ta and cwv as variables in the iterations
clear-sky pixels defined by MODIS cloudmask	at 99% confidence over land at 66% confidence over lakes	at confidence of >= 95% over land <= 2000m at confidence of >= 66% over land > 2000m at confidence of >= 66% over lakes
removing cloud-contaminated LSTs	not implemented	implemented for M*D11A1 and M*D11B1
empirical optical-leak correction to band 32	not implemented	made for the last four pixels each scan line for Terra MODIS L1B granules
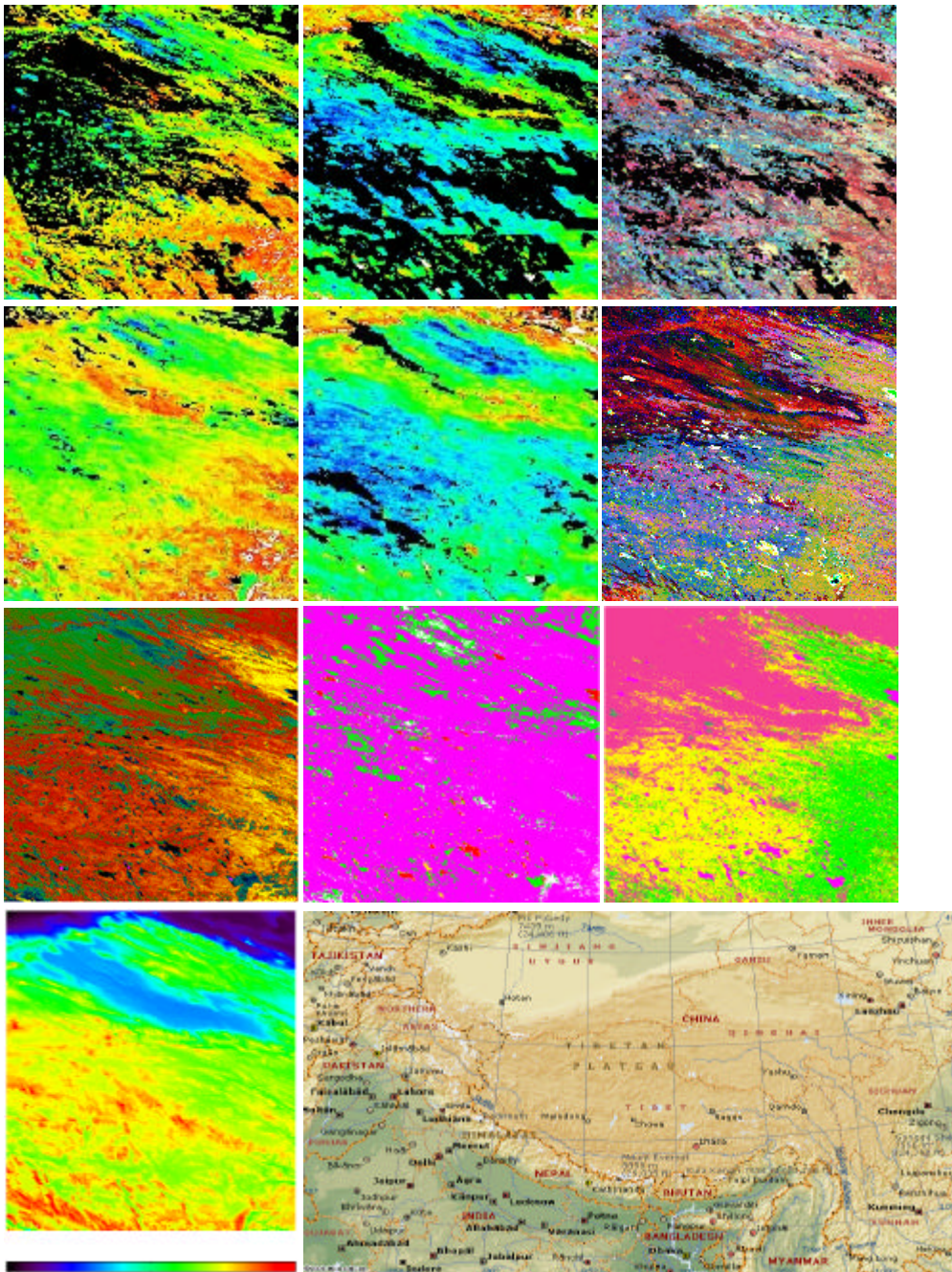
Fig. 1, Comparisons of the V4 (top row) and V5 (row 2) daytime (left) and nighttime (middle) LSTs and emissivity RGB images (right) in the MOD11B1 products in tile h25v05, retrieved from Terra MODIS data acquired on 21 January 2003. In row 3 are NDVI (left), snow cover in red (middle) and landcover (right). The landcover types are in color table: magenta for 0, yellow for 6, green for 7, red for 10, white for 15, and coral for 16. At the left side of bottom row is the surface elevation image (the range of the color scale for surface elevation is from 900-6372m). The geographic locations of the four corners (clockwise starting at the top left) of tile h25v05 are (40° N, 91.372^o E), (40° N, 104.427^o E), (30° N, 92.380^o E) and (30° N, 80.380^o E). The geographic coverage of the tile is given by placing its corners on the geographic map at the bottom (Courtesy of Microsoft Mappoint online service).
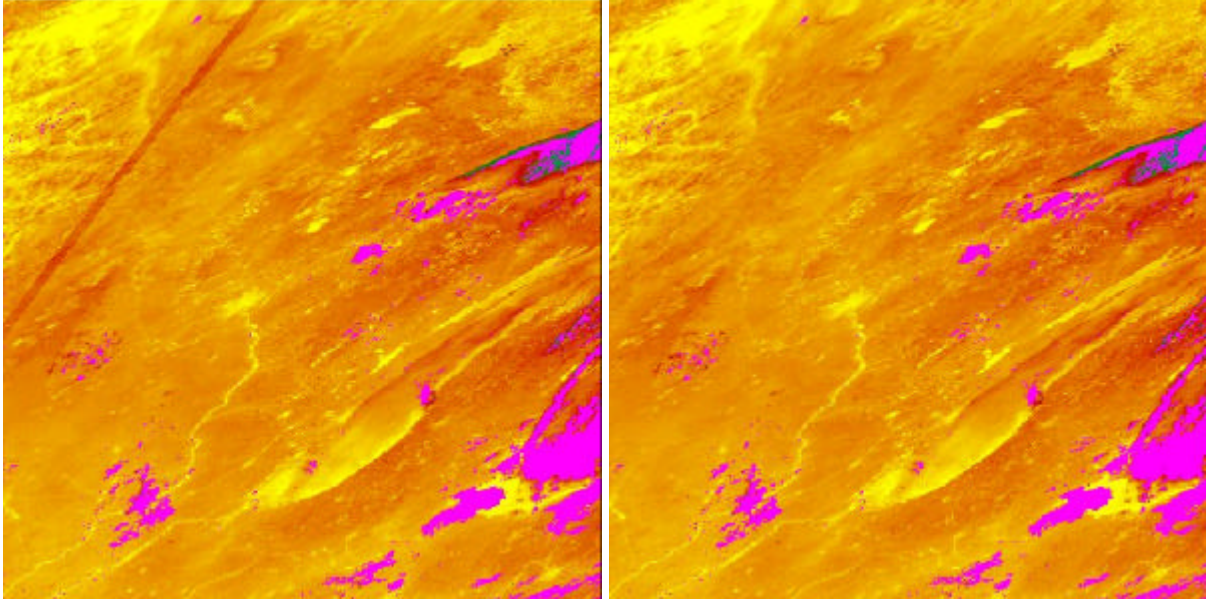
Fig. 2, Images of nighttime LSTs in MOD11A1.A2003194.h11v04 files before (left) and after (right) applying an empirical correction for optical leak to band 32 in the last four pixels each scan line in the Terra MODIS L1B granules. The dark stripe in the upper left portion of the left image has a width of approximately 20 grids where LST values are cooler than their neighboring by 2-4K due to the effect of optical leak to band 32. As shown in the image on the right side, this stripe disappears after applying the empirical correction for the optical leak. The 3rd executable of PGE16 has not run on tile h11v04 in both cases so that cloud contaminated LSTs have not been removed from these two images.