

# Time History of Fire Evolution from MODIS Observation

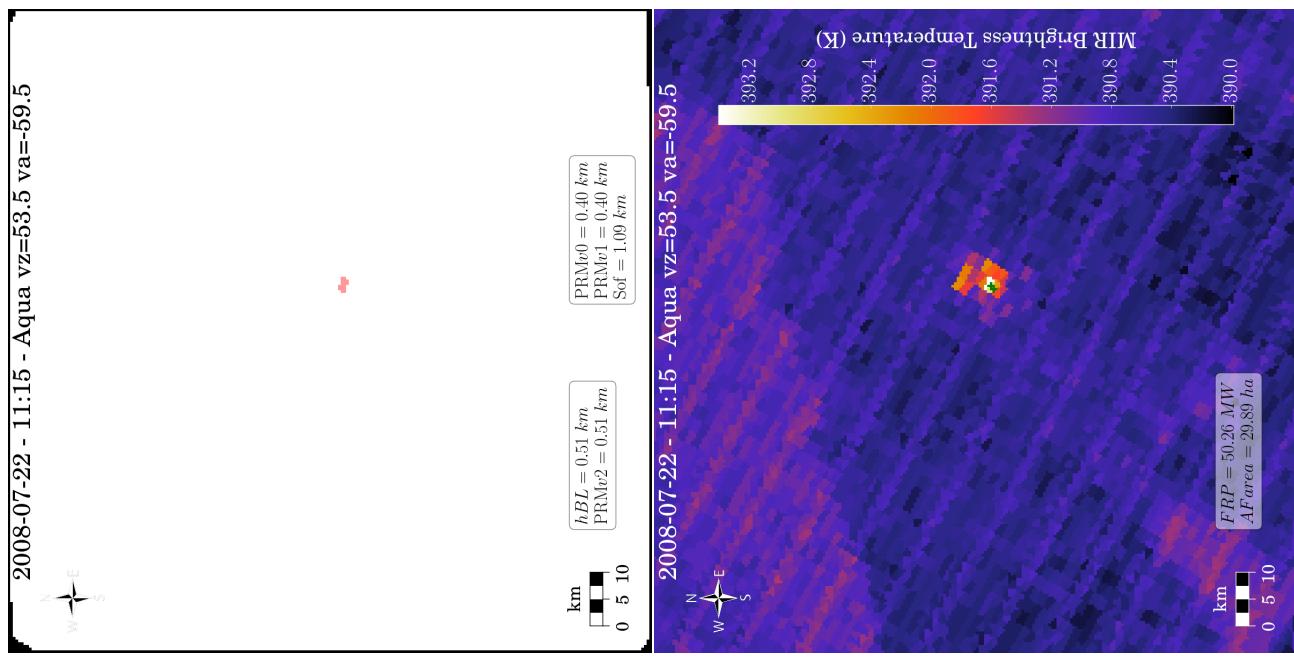
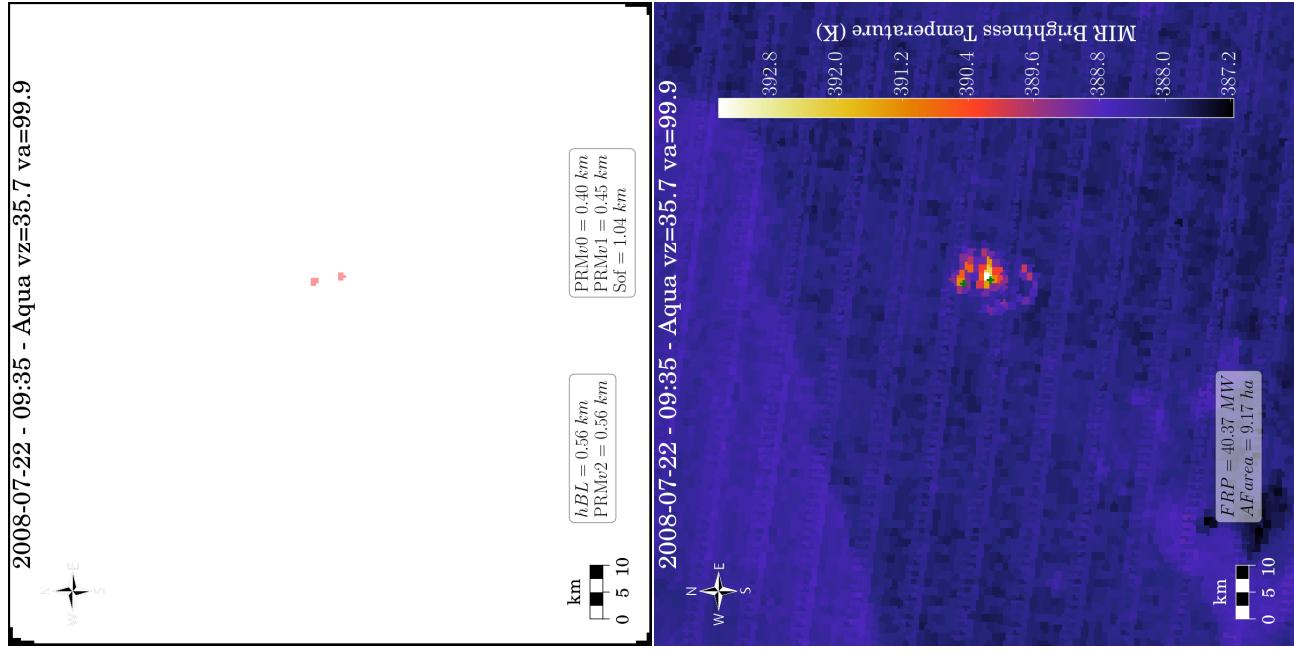
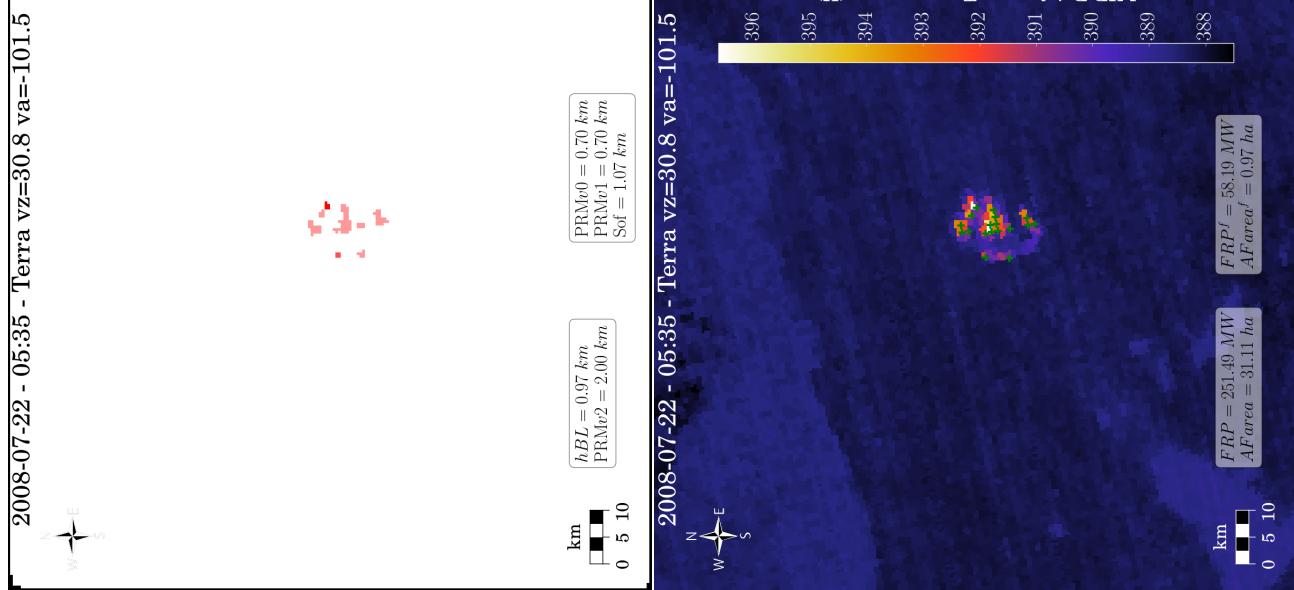
Ronan Paugam

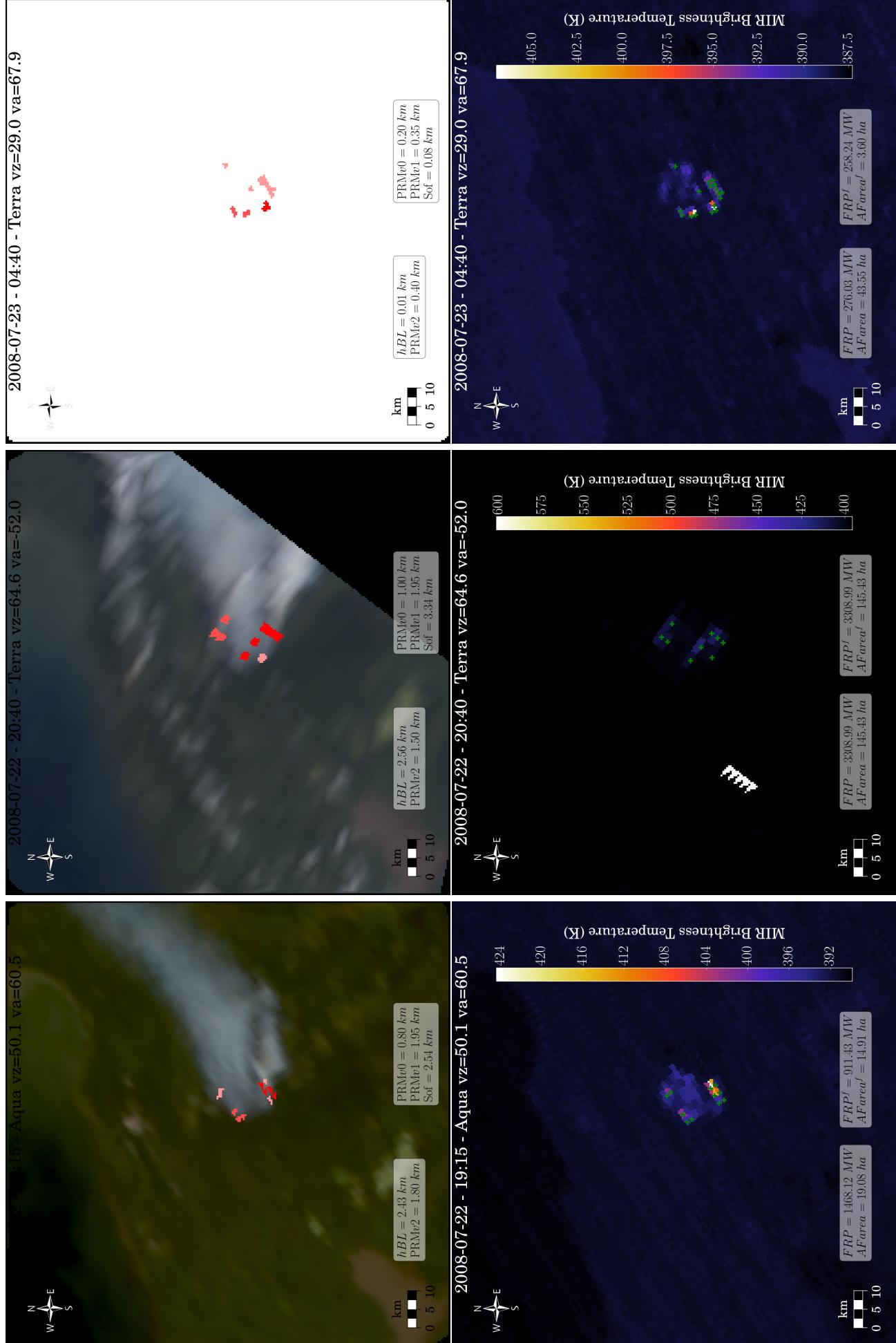
August 6, 2016

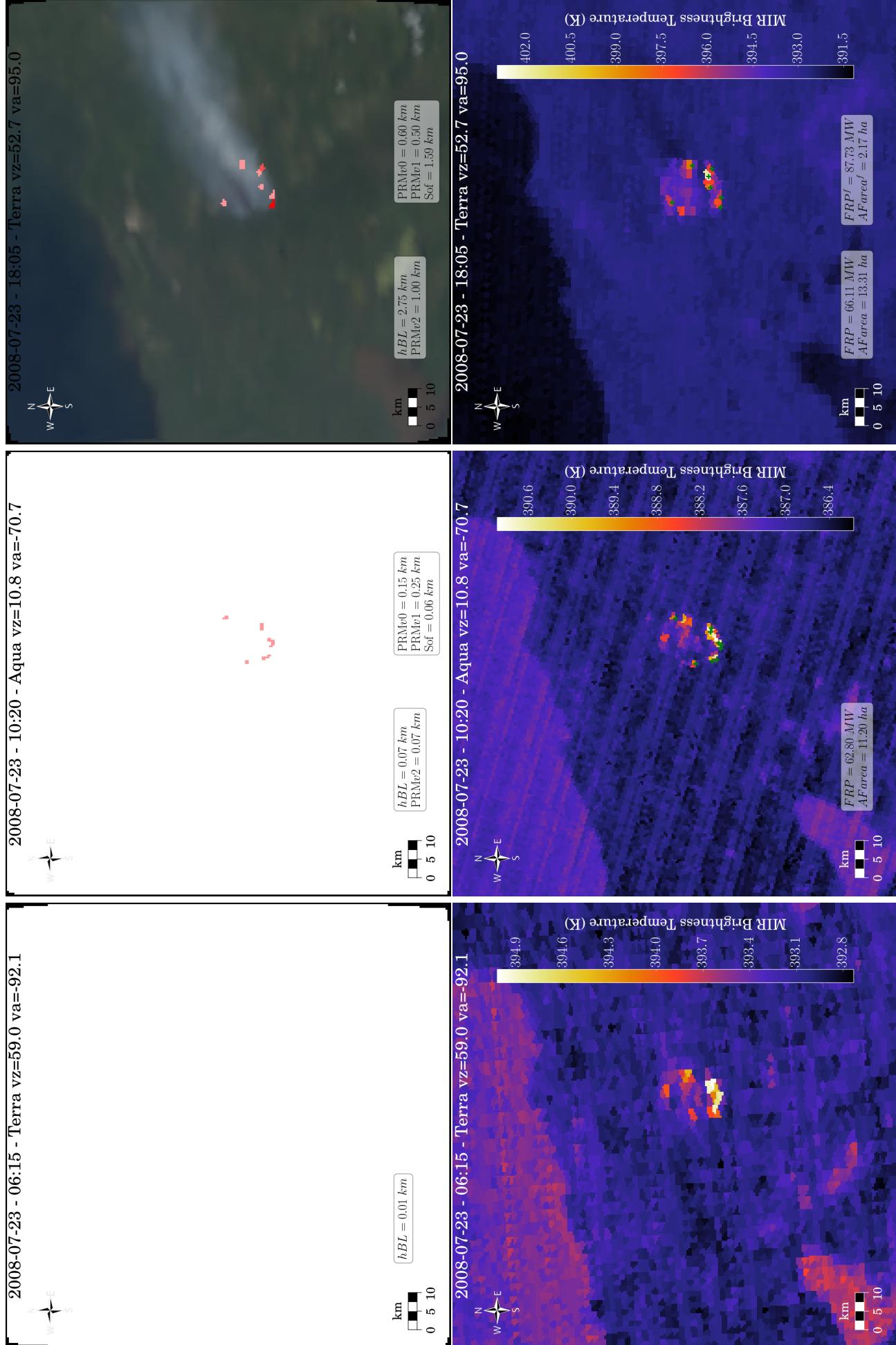
In the following pages, (i) figures from the upper row are color composite images made from the MODIS bands 0.6 (red,R), 0.55 (green,G) and 0.47  $\mu m$  (blue,B) and geo-referenced on a 120x120  $km^2$  grid with a 0.5  $km$  resolution around the location of the MISR detected fire, (ii) and figures in the lower row are brightness temperature in the middle infra red (MODIS band 3.9  $\mu$ ) where the green crosses mark the fire pixels of the MOD14 product.

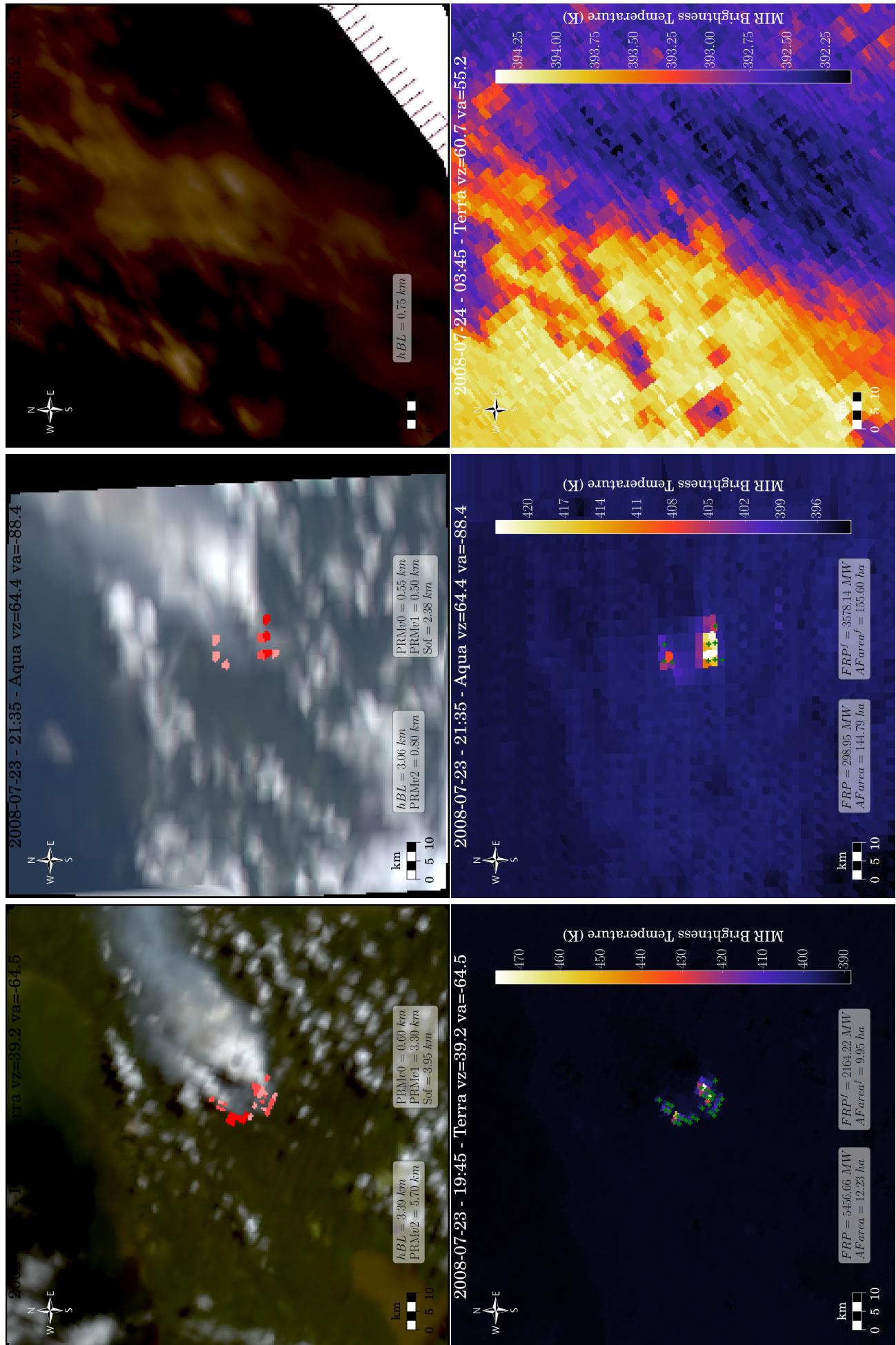
In the color composite images, height of the boundary layer from ECMWF forecast product is reported ( $hBL$ ), as well as the plume height as derived from the original Plume Rise Model (PRMv0) of Freitas et al. (2007), updated versions of PRMv0, PRMv1 from Val Martin et al. (2012) and PRMv2 from Paugam et al. (2015), and the parameterization of (Sofiev et al., 2012, *Sof*).

In the MIR images, FRP from the biggest fire cluster formed of MOD14 pixels and located within 20  $km$  of the fire location is reported. The Active Fire (AF) area (*AFarea*) of the fire cluster as derived from the Dozier (1981) algorithm is also reported. When hot pixels are present in the cluster ( $T_{pixel} > 600 K$ ), a filter is applied to remove cool (*i.e.* smoldering) pixels and FRP and AFarea of the new filtered cluster are indicated. For each pixel, the temperatue  $T_{pixel}$  is derived from the Dozier (1981) algorithm applied at the pixel level.





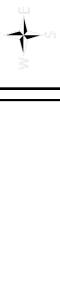




2008-07-24 - 05:20 - Terra v<sub>z</sub>=17.9 v<sub>a</sub>=-104.0

2008-07-24 - 09:25 - Aqua v<sub>z</sub>=45.4 v<sub>a</sub>=96.6

2008-07-24 - 11:00 - Aqua v<sub>z</sub>=46.9 v<sub>a</sub>=-61.7



2008-07-24 - 05:20 - Terra v<sub>z</sub>=17.9 v<sub>a</sub>=-104.0

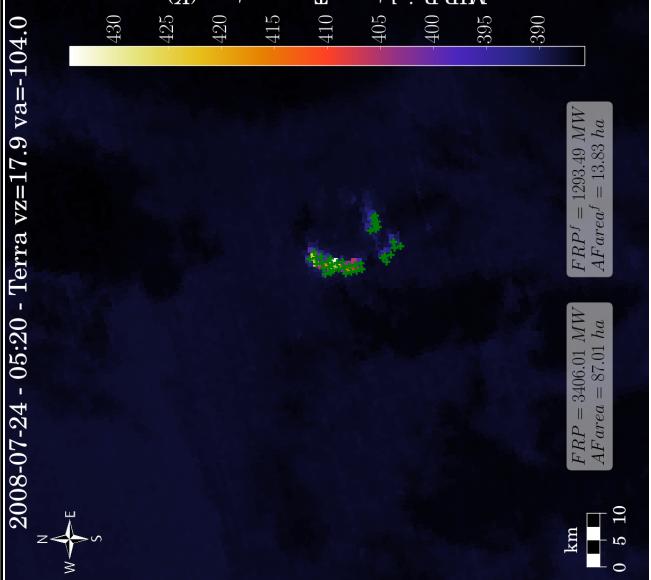
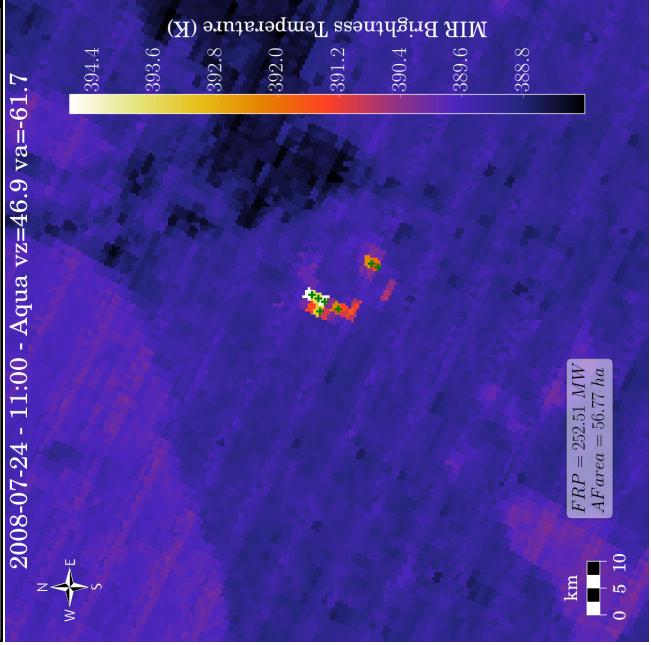
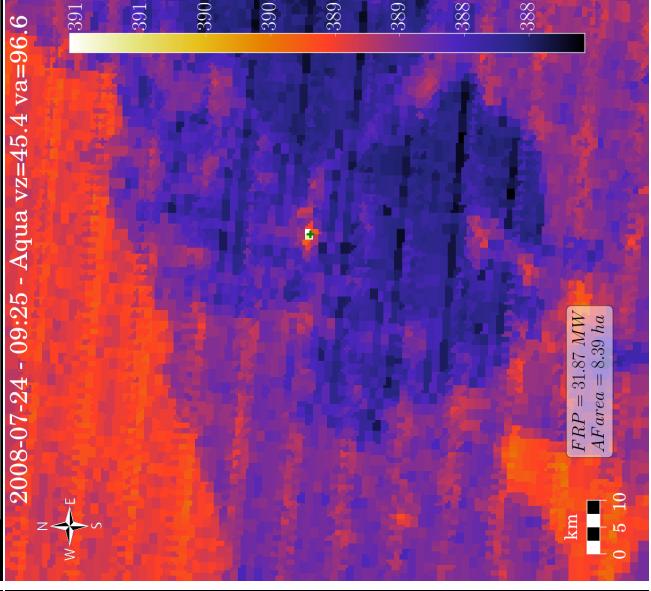
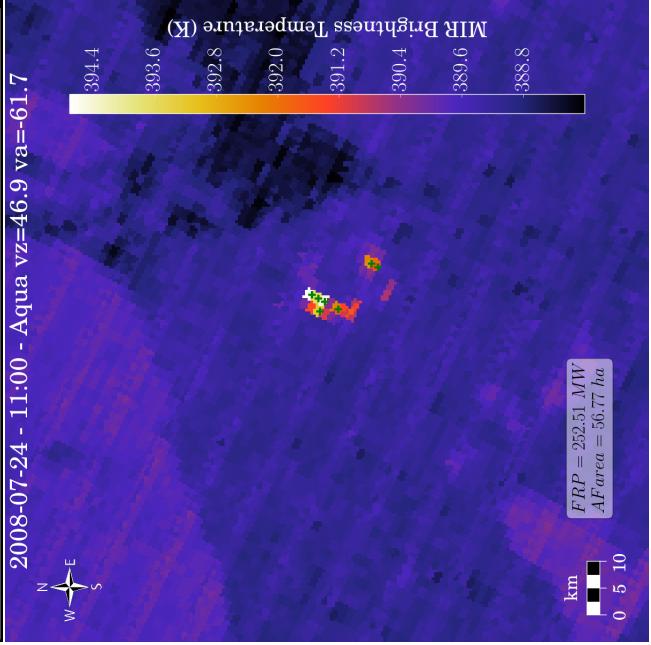
PRM<sub>v0</sub> = 0.20 km  
PRM<sub>v1</sub> = 1.00 km  
Sof = 1.15 km

km  
hBL = 0.05 km  
PRM<sub>v2</sub> = 0.50 km

km  
hBL = 0.11 km  
PRM<sub>v1</sub> = 0.11 km  
Sof = 0.61 km

km  
hBL = 0.08 km  
PRM<sub>v2</sub> = 0.08 km

km  
hBL = 0.25 km  
PRM<sub>v1</sub> = 0.20 km  
Sof = 0.23 km

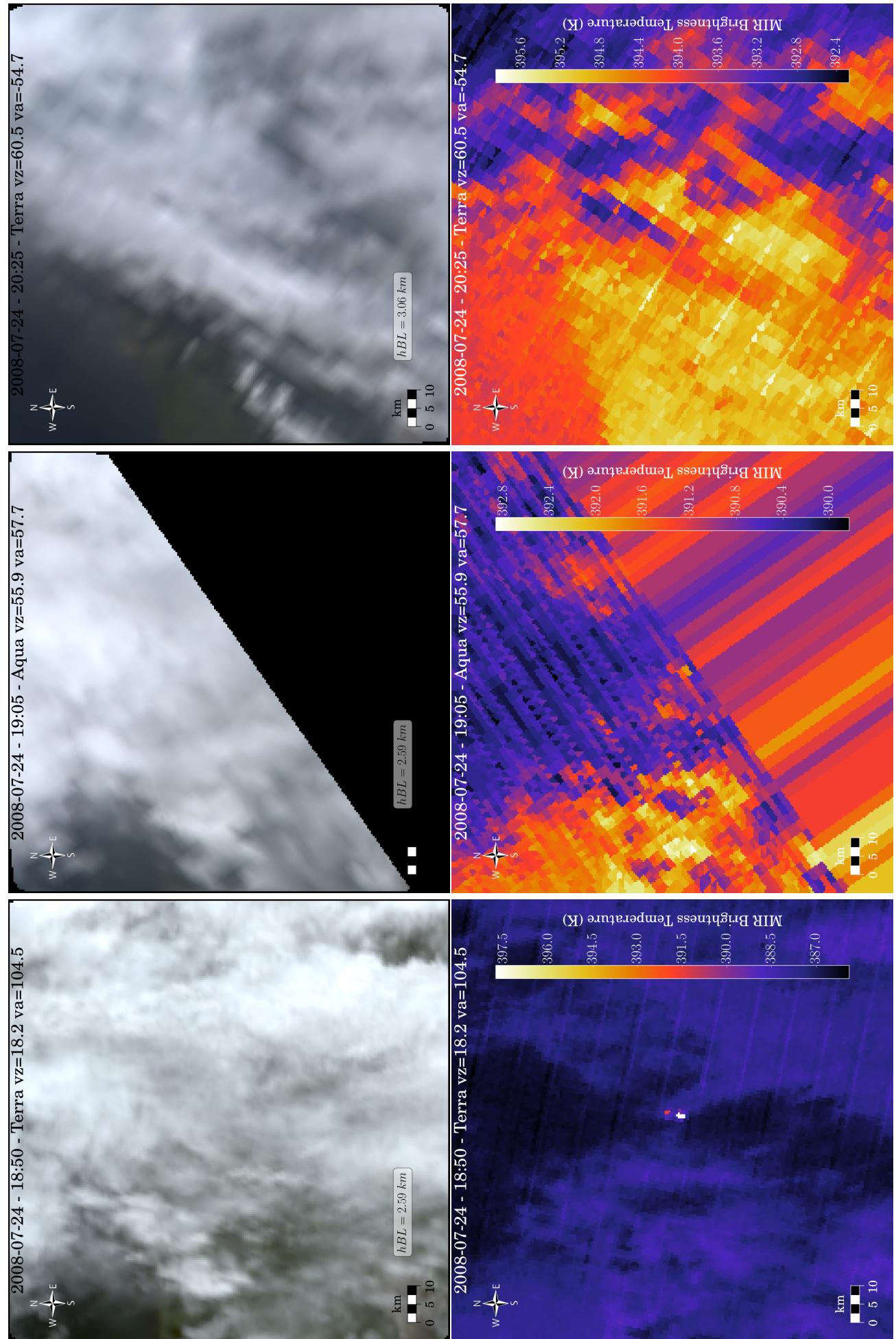


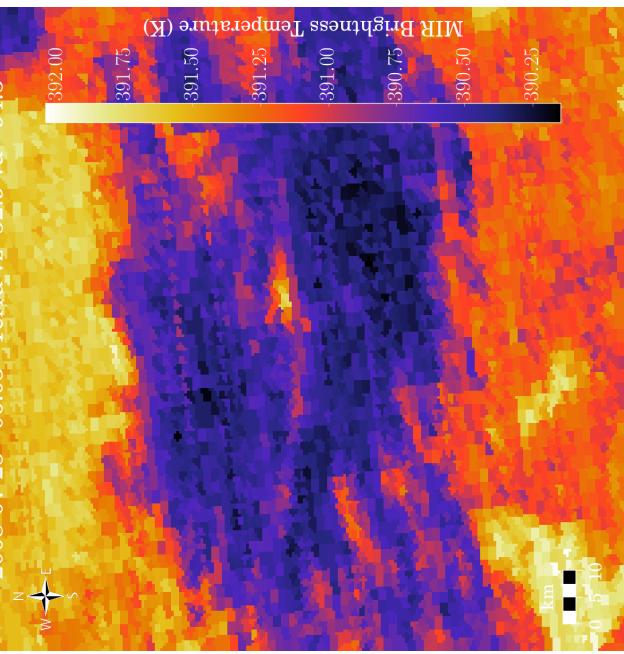
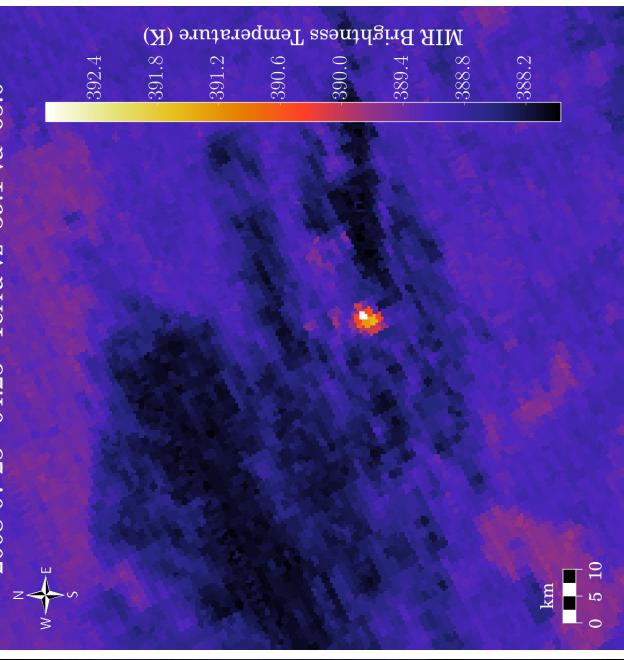
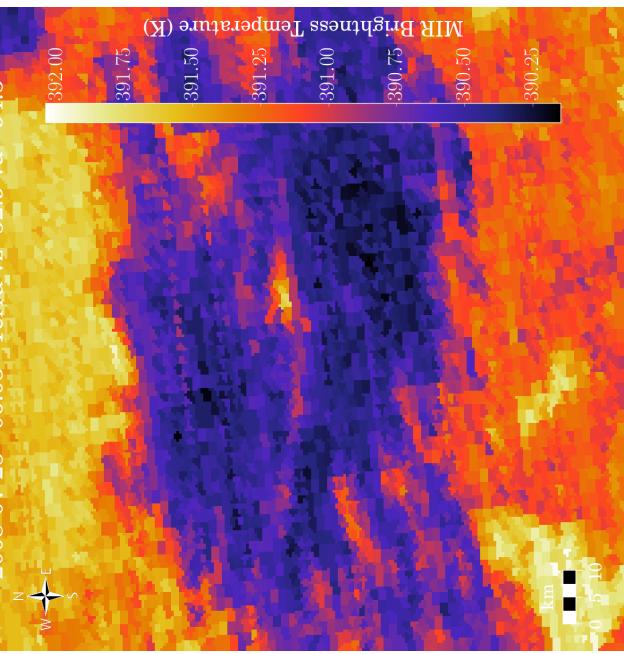
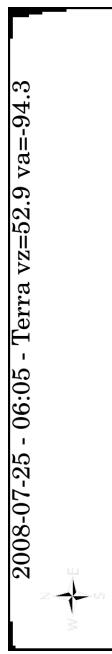
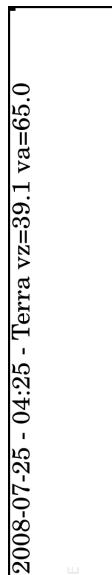
km  
FRP = 252.51 MW  
AFarea = 56.77 ha

km  
FRP = 31.87 MW  
AFarea = 8.39 ha

km  
FRP = 3406.01 MW  
AFarea = 87.01 ha

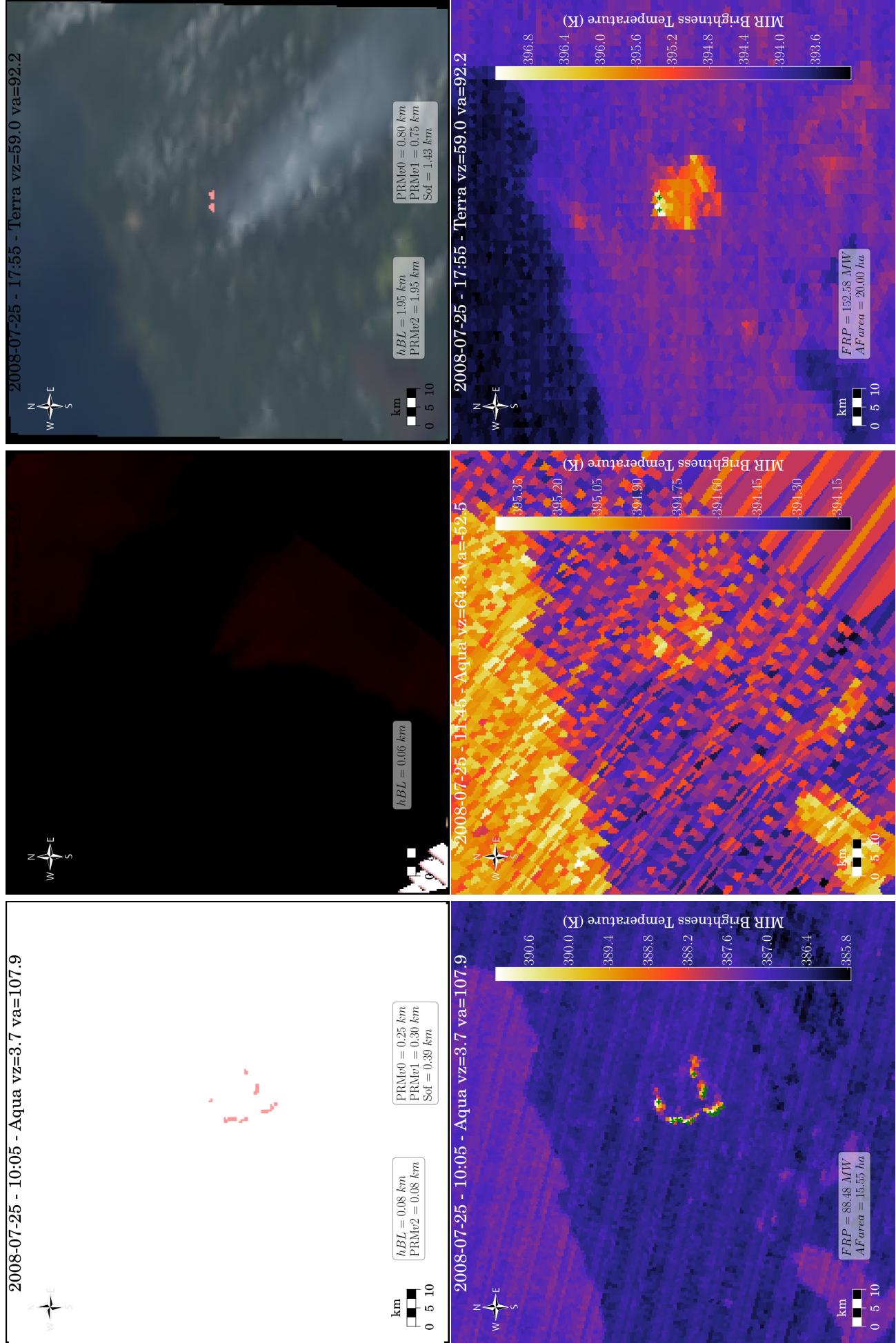
km  
FRP = 1293.49 MW  
AFarea = 13.83 ha

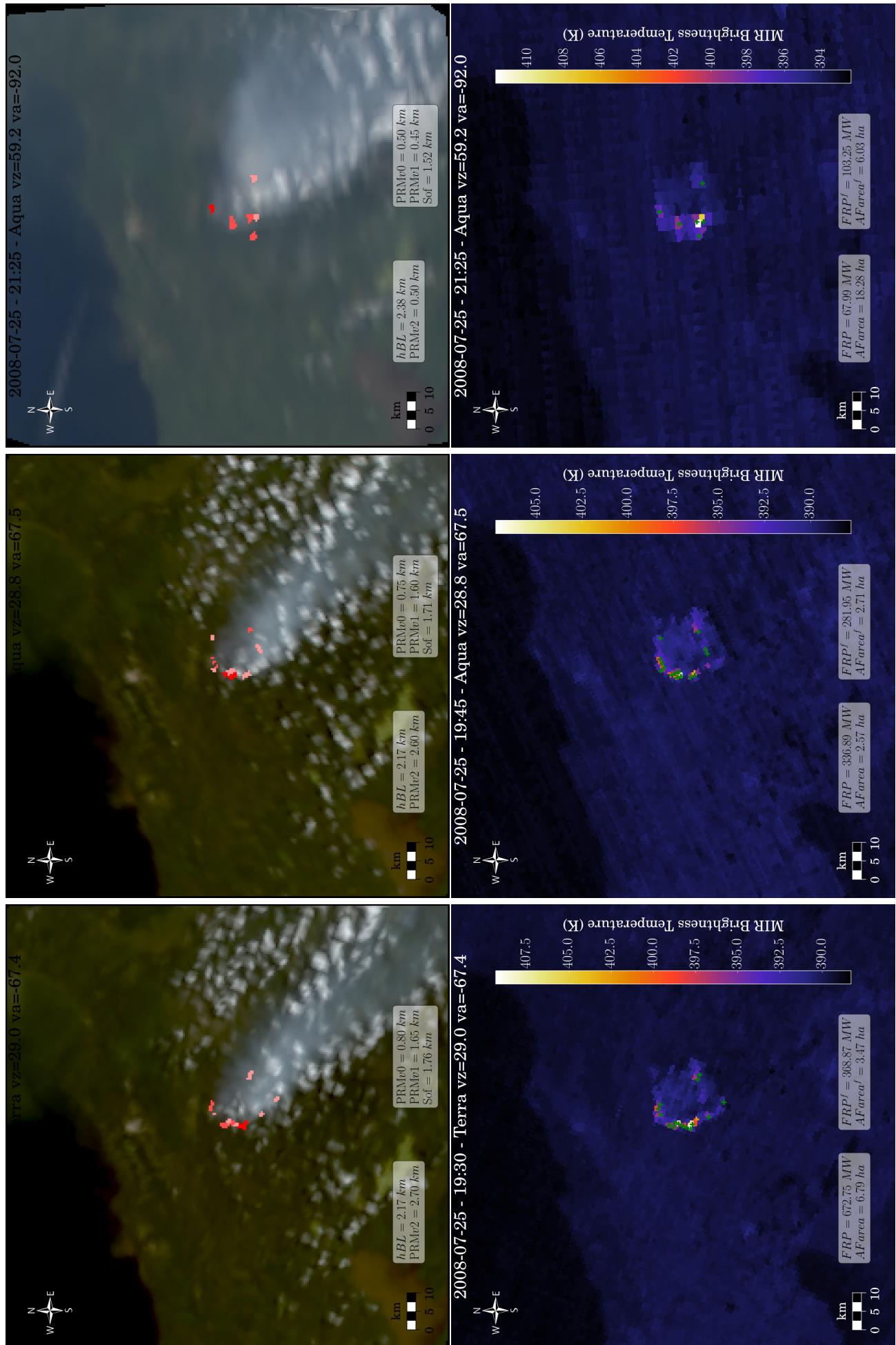


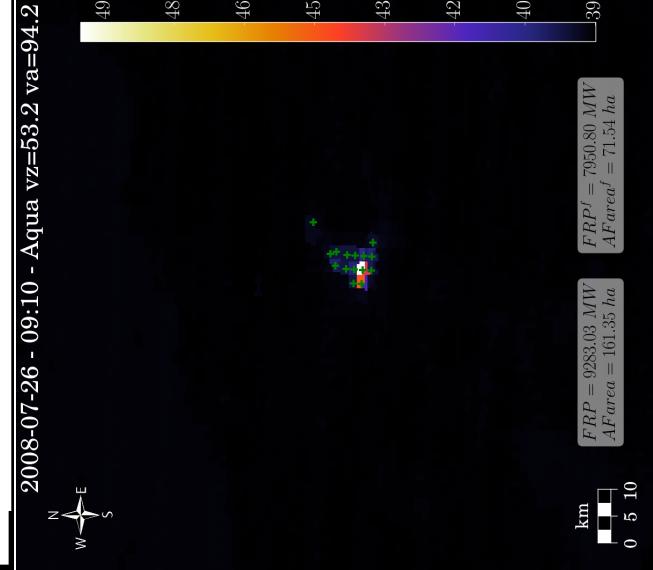
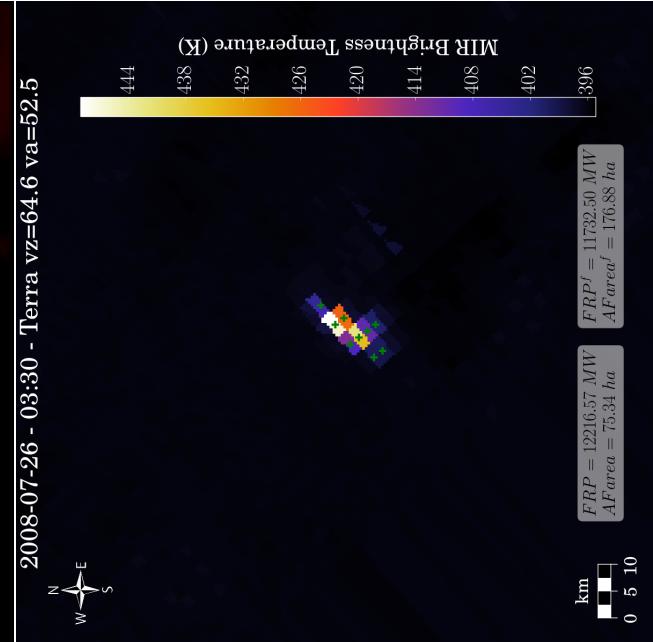
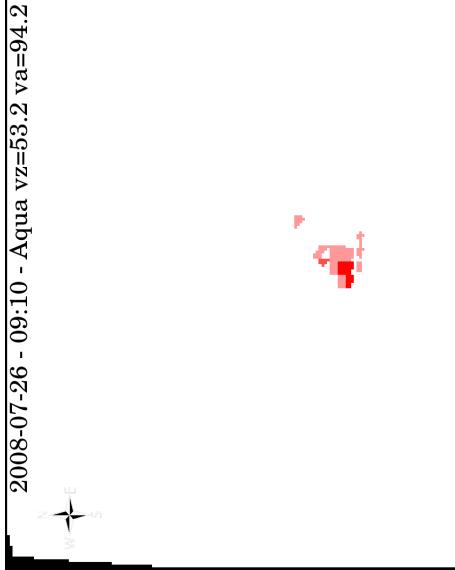
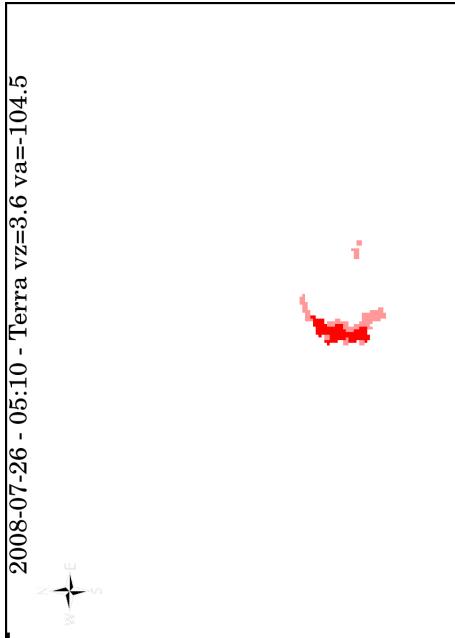
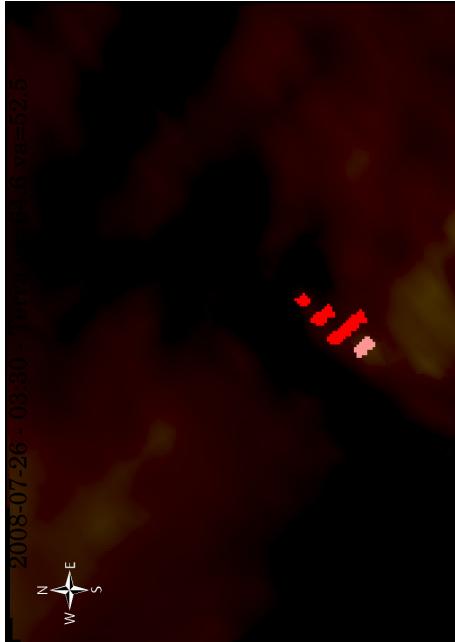


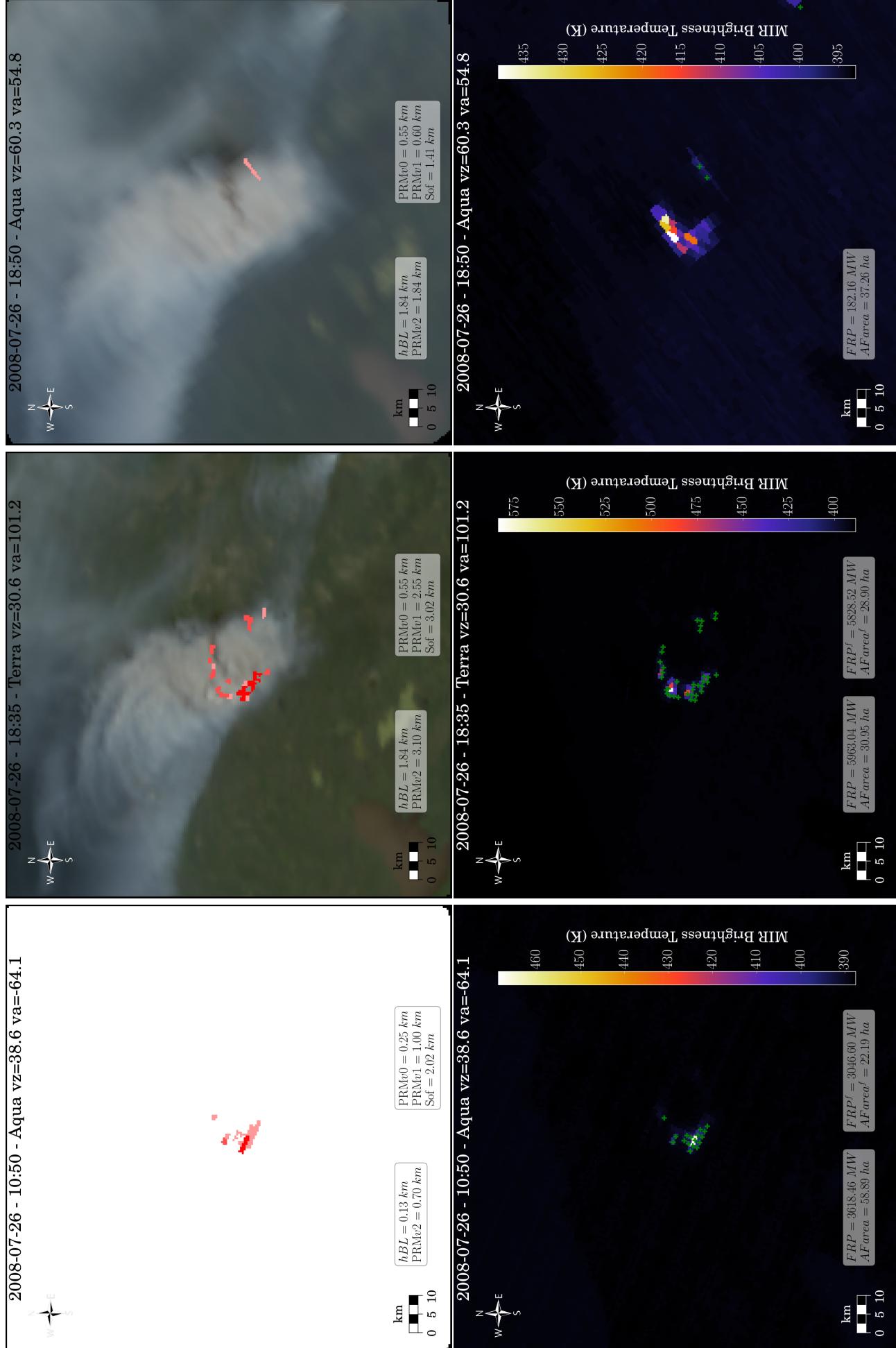
$FRP^f = 549.09 MW$   
 $AFarea^f = 6.82 ha$

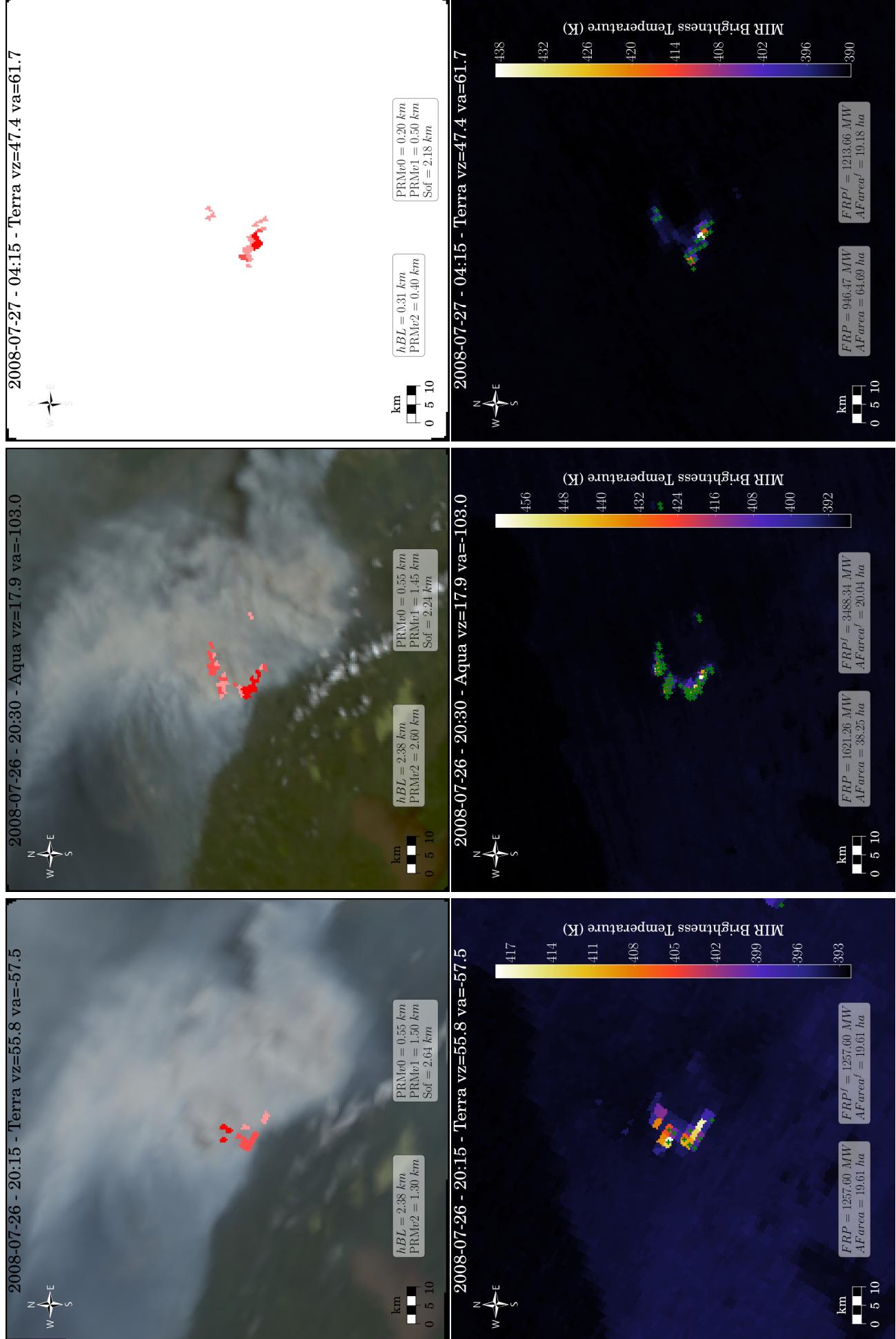
$FRP^f = 611.11 MW$   
 $AFarea^f = 14.34 ha$







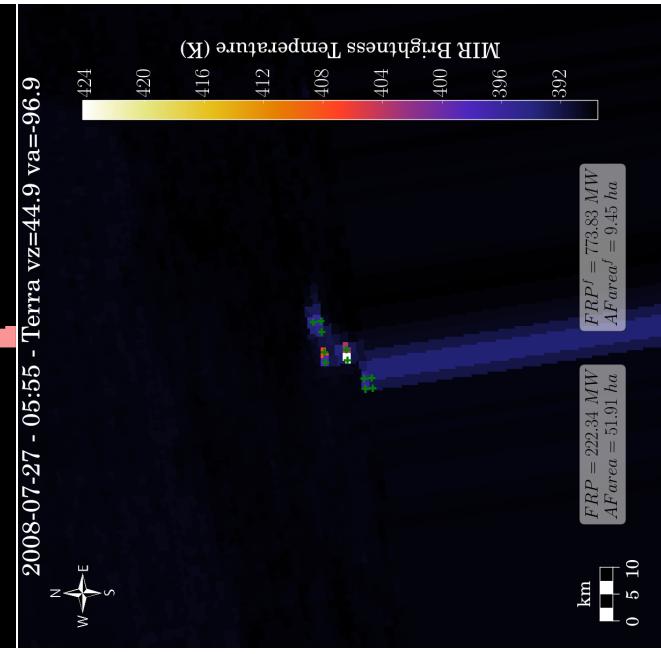
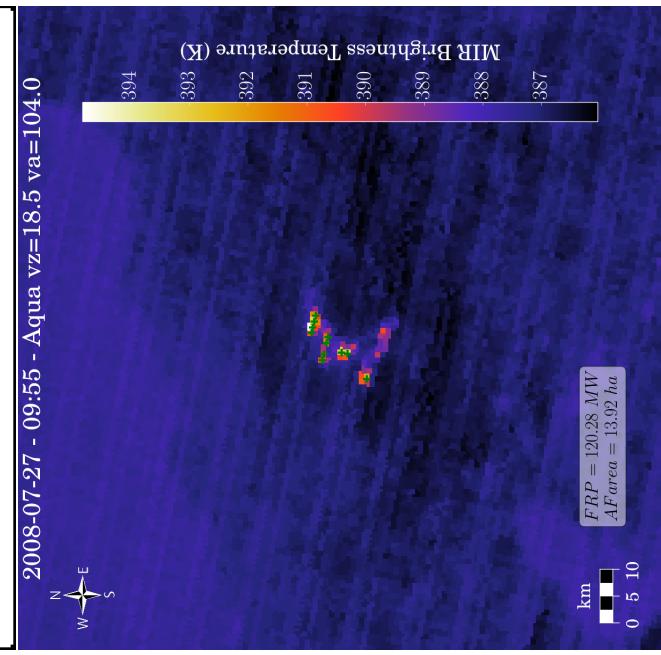
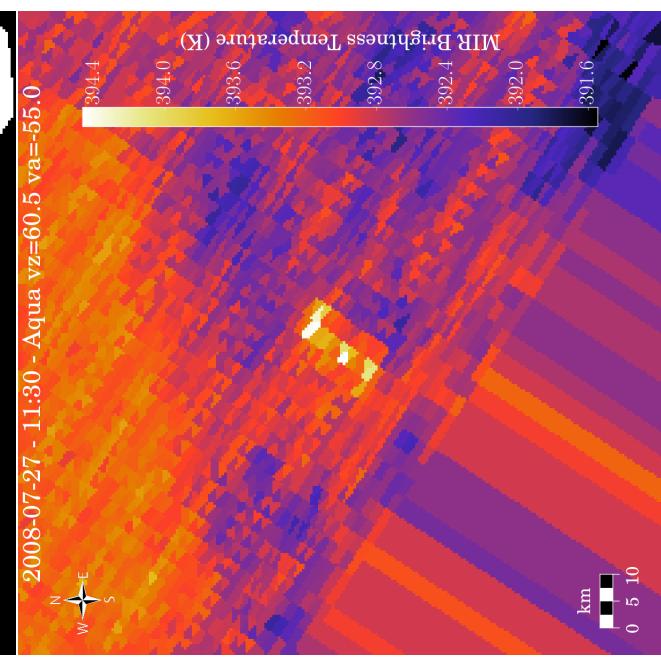
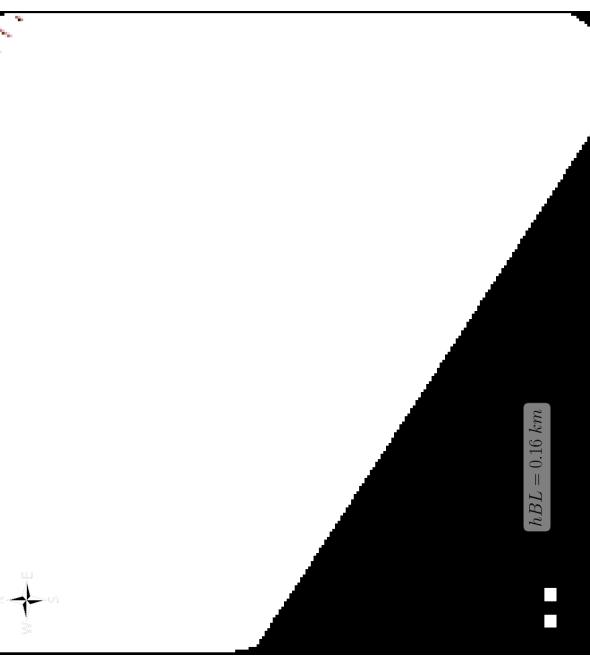


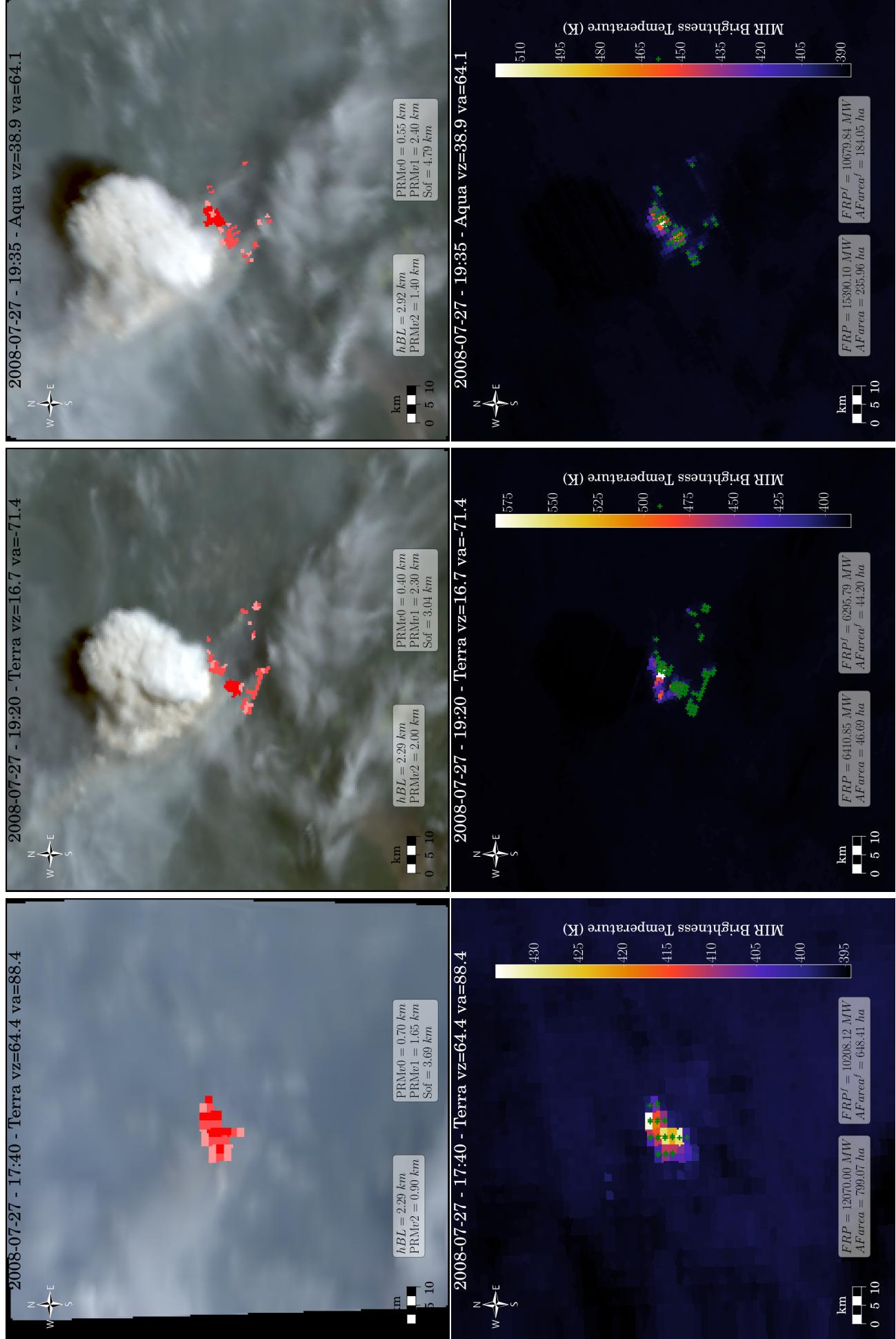


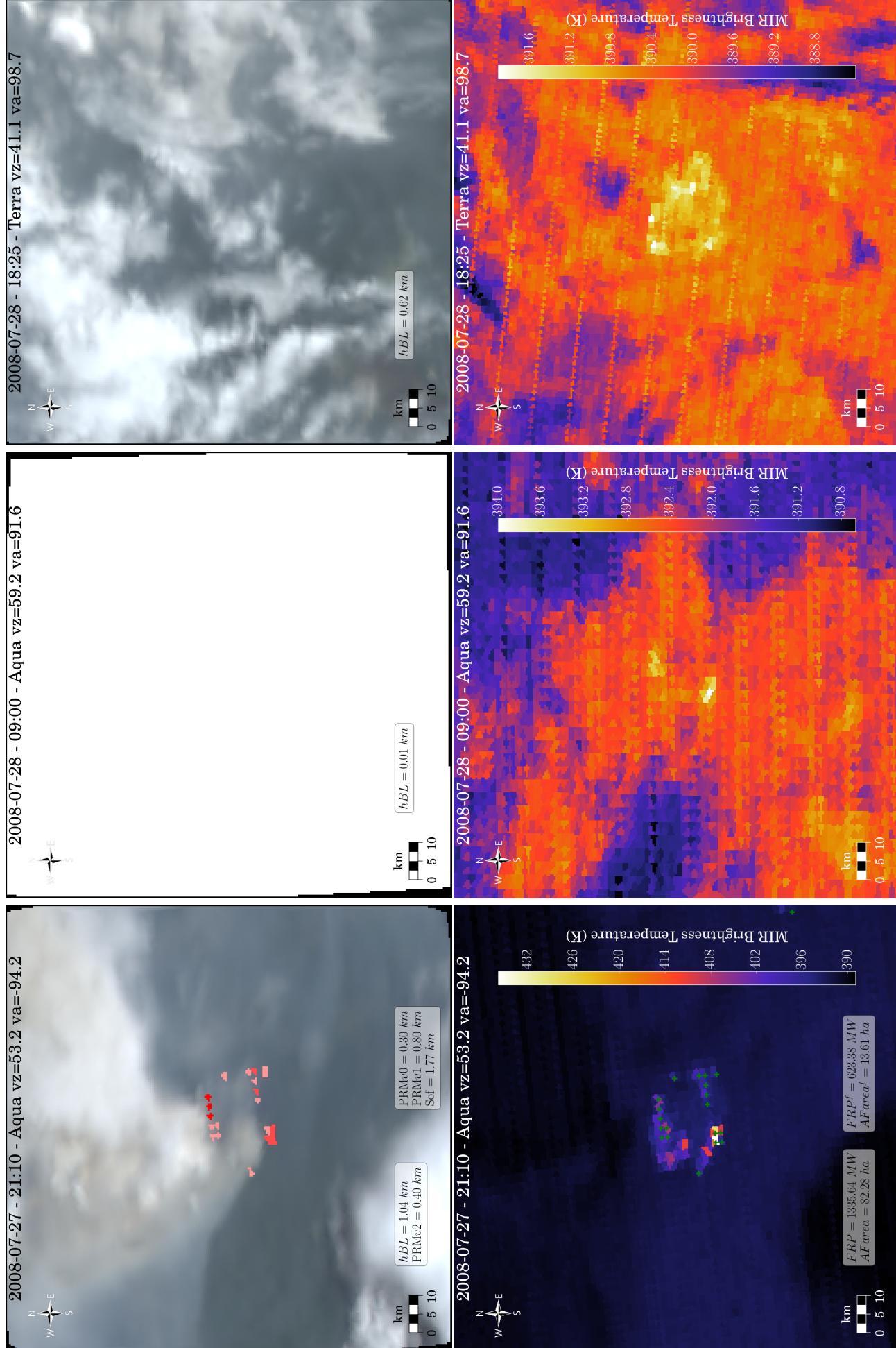
2008-07-27 - 05:55 - Terra v<sub>z</sub>=44.9 v<sub>a</sub>=-96.9

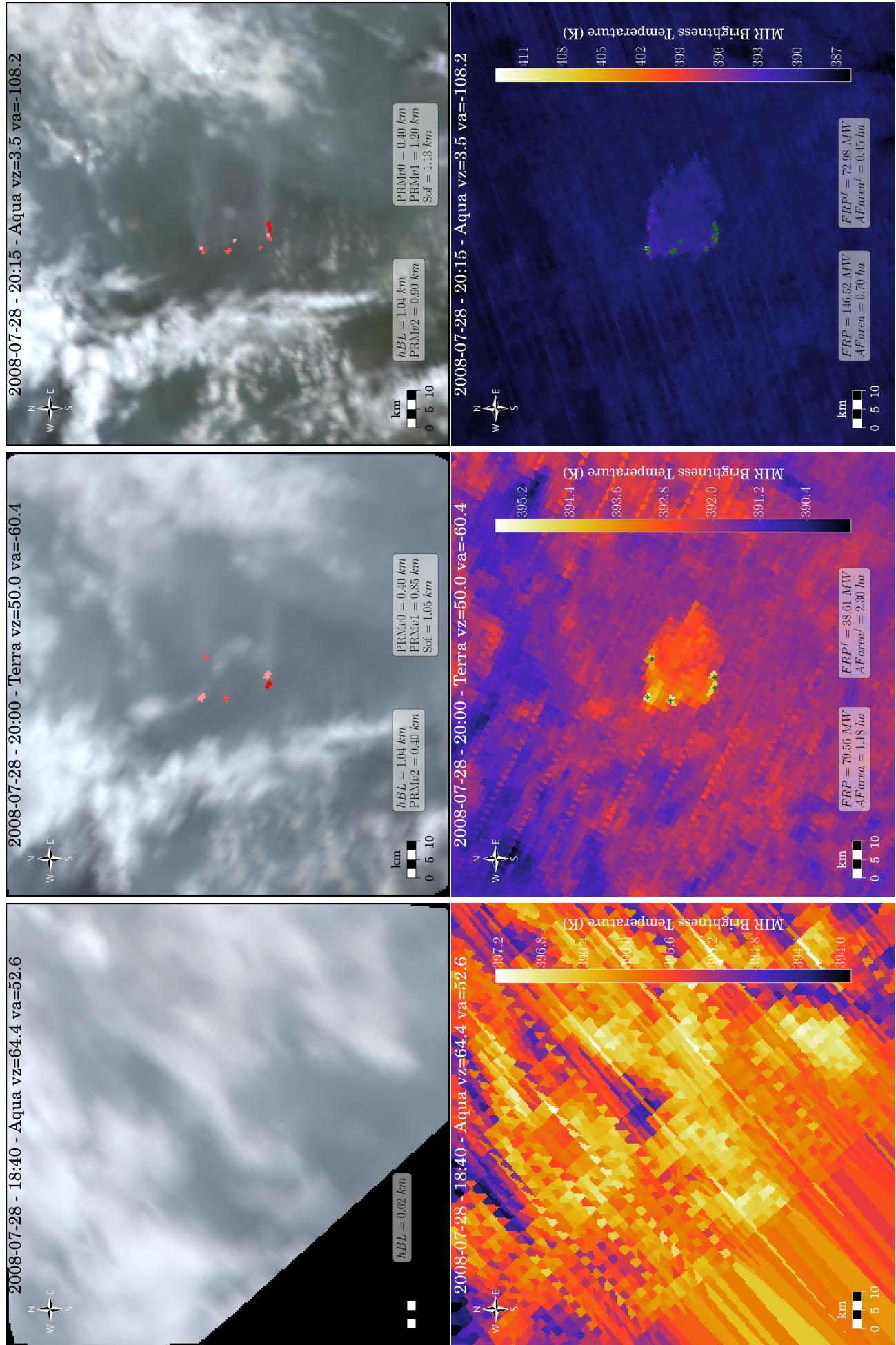
2008-07-27 - 09:55 - Aqua v<sub>z</sub>=18.5 v<sub>a</sub>=104.0

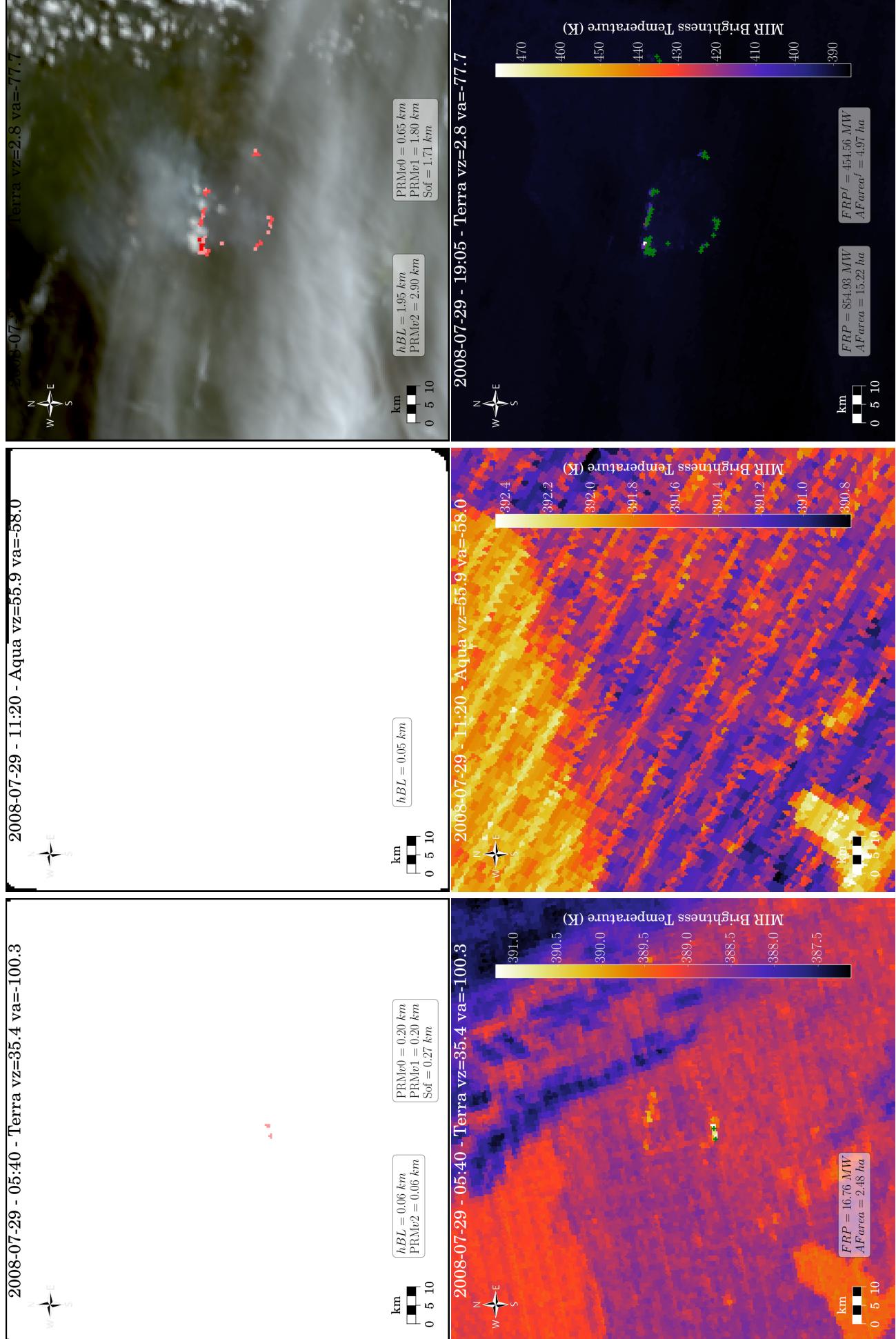
2008-07-27 - 11:30 - Aqua v<sub>z</sub>=60.5 v<sub>a</sub>=-55.0





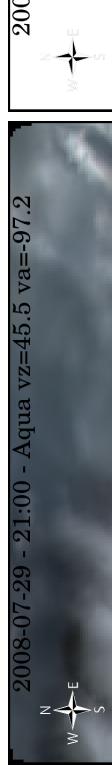




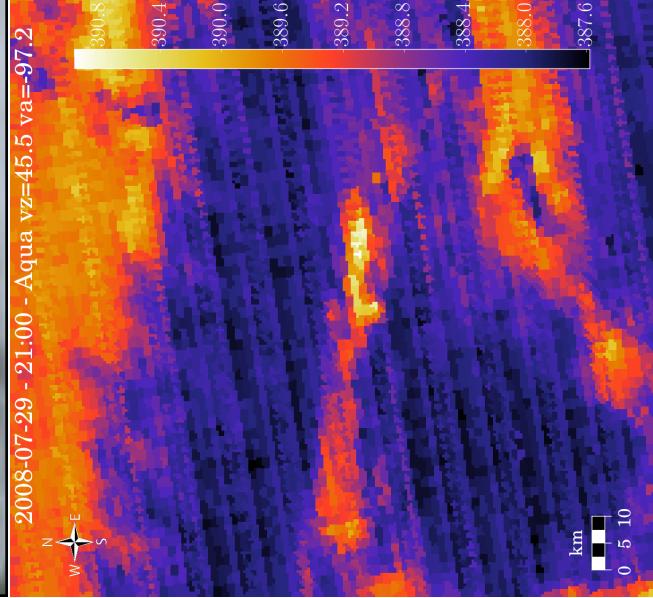
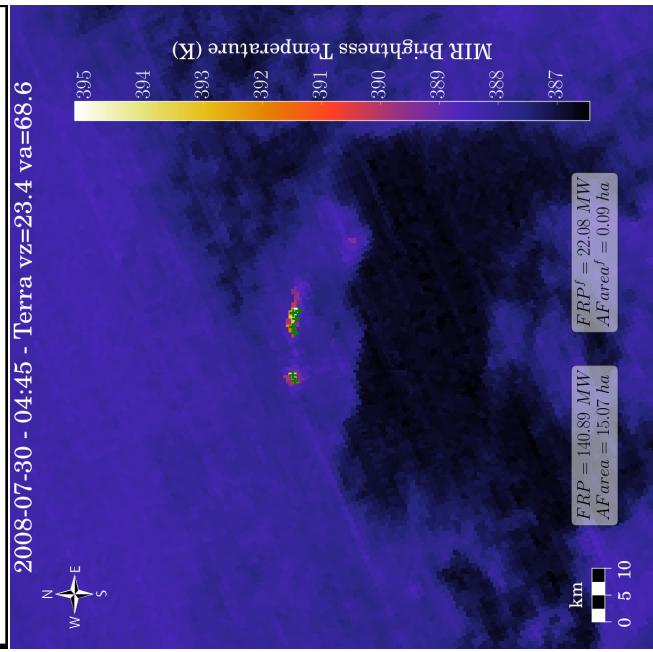
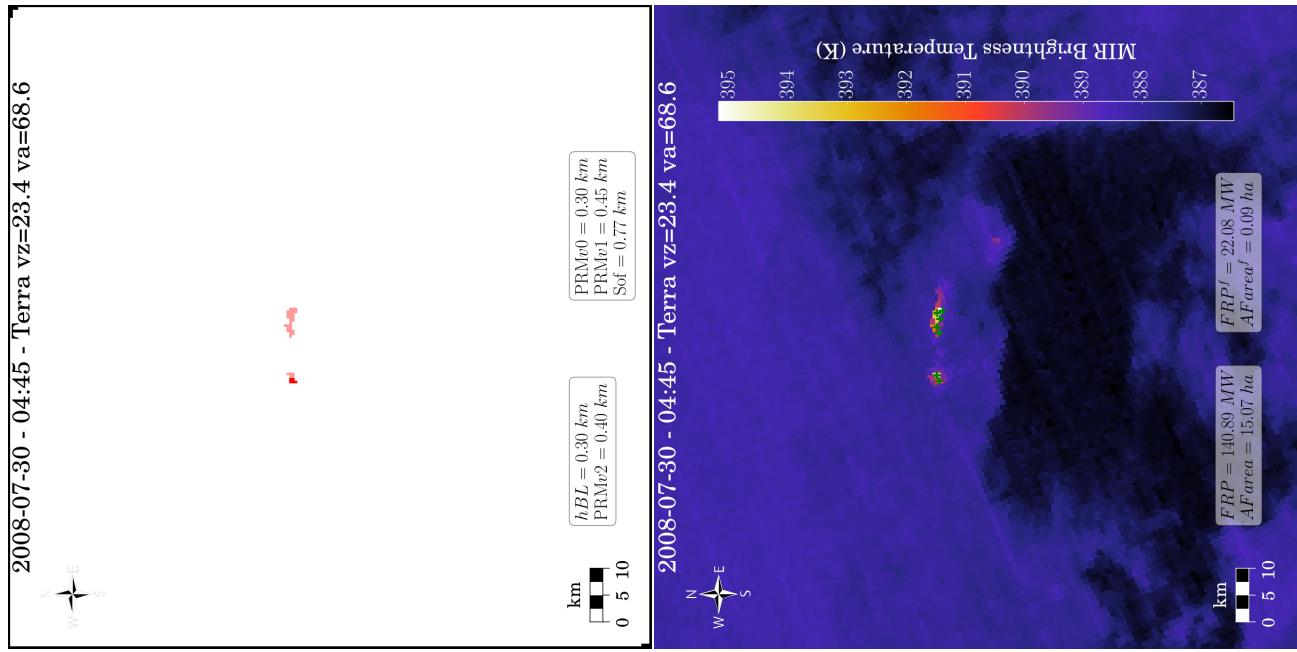




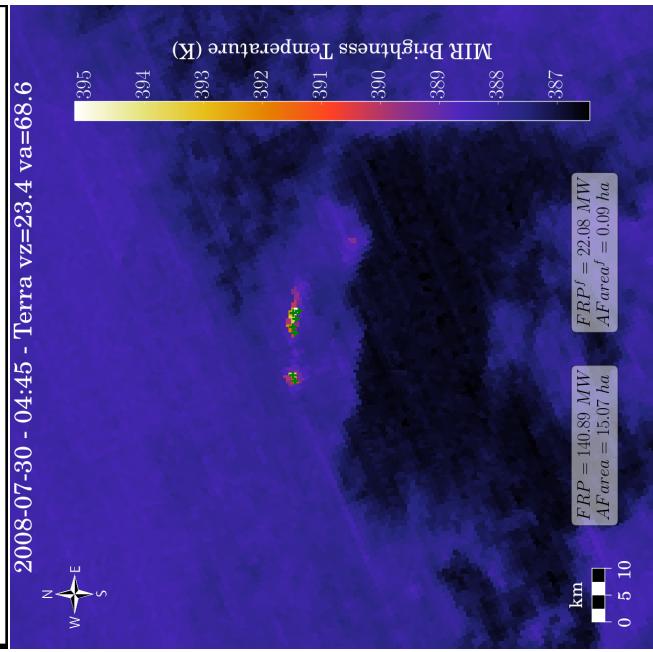
2008-07-29 - 21:00 - Aqua v<sub>z</sub>=45.5 v<sub>a</sub>=-97.2



2008-07-30 - 04:45 - Terra v<sub>z</sub>=23.4 v<sub>a</sub>=68.6



2008-07-29 - 21:00 - Aqua v<sub>z</sub>=45.5 v<sub>a</sub>=-97.2



## References

- Dozier, J.: A method for satellite identification of surface temperature fields of subpixel resolution, *Remote Sensing of Environment*, 11, 221 – 229, doi:[http://dx.doi.org/10.1016/0034-4257\(81\)90021-3](http://dx.doi.org/10.1016/0034-4257(81)90021-3), <http://www.sciencedirect.com/science/article/pii/0034425781900213>, 1981.
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- Paugam, R., Wooster, M., Atherton, J., Freitas, S., Schultz, M. G., and Kaiser, J. W.: Development and Optimization of a Wildfire Plume Rise Model based on Remote Sensing Data Input, *Atmospheric Chemistry and Physics Discussions*, ??, ??, 2015.
- Sofiev, M., Ermakova, T., and Vankevich, R.: Evaluation of the smoke-injection height from wild-land fires using remote-sensing data, *Atmospheric Chemistry and Physics*, 12, 1995–2006, doi:10.5194/acp-12-1995-2012, <http://www.atmos-chem-phys.net/12/1995/2012/>, 2012.
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