A surface reflectance standard product from LDCM and supporting activities

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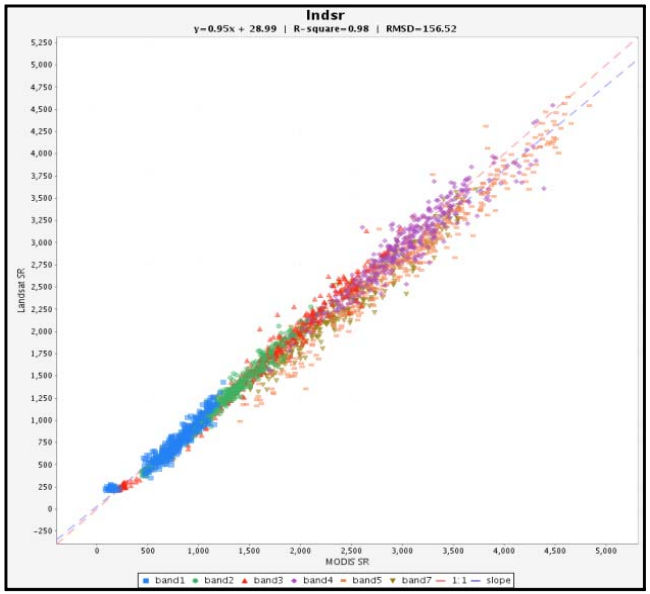
Recent activities

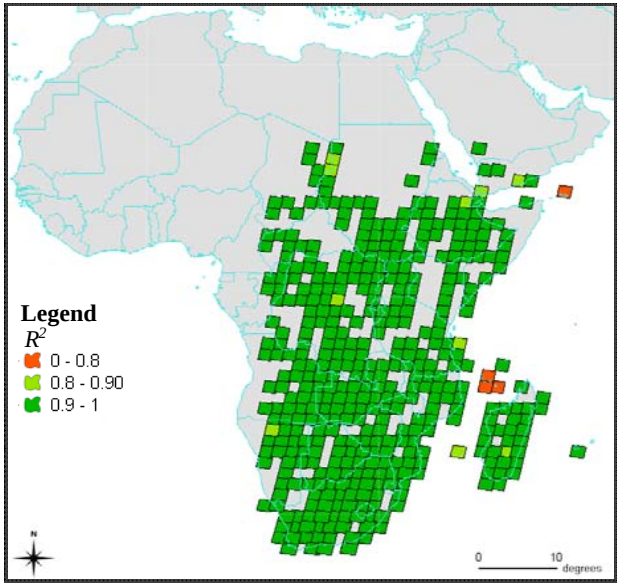
- Update to the LEDAPS code after testing/evaluation by the GFCC project (Chengquan Huang)
  - Bugs fixes
  - Product reformating
- Validation/Evaluation of the SR product by UMCP by comparison to MODIS SR product (Cheng Huang)
- Evaluation of the cloud mask by comparison to validation cloud mask (data provided by Lazaros Oreopoulos)

Landsat-MODIS SR Comparison

- Landsat 7 SR ≈ MODIS SR (daily)
  - Same acquisition date, ~30 minutes apart (Landsat 7 images)
  - Aggregate Landsat to MODIS resolution
  - Use samples from homogeneous areas
- Fully automated, will be applied to all Landsat 7 images
- Landsat 5 SR ≈ MODIS SR (NBAR)



R square
RMSD

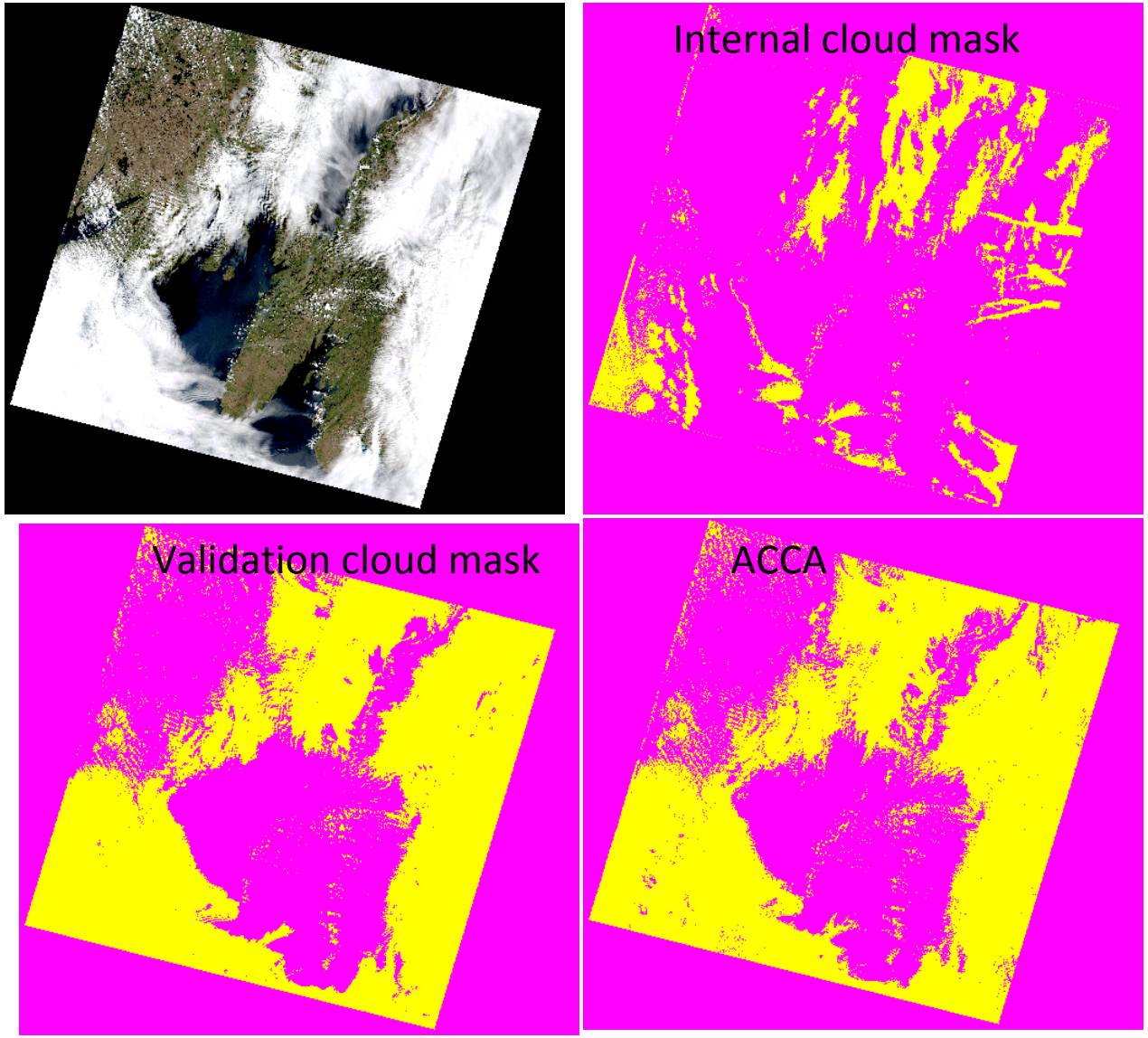


LEDAPS Internal cloud mask evaluation

Method

- 72 Landsat scenes mainly covering mid latitude
- Cloud mask comparison
  - ACCA cloud mask
  - LEDAPS : Internal cloud mask based on SR product
  - VCM :Validation Cloud Mask (operator made)
- Metrics for cloud detection versus VCM
  - Rate of omission of cloud %: Leakage
  - Rate of commission of cloud % : False detection

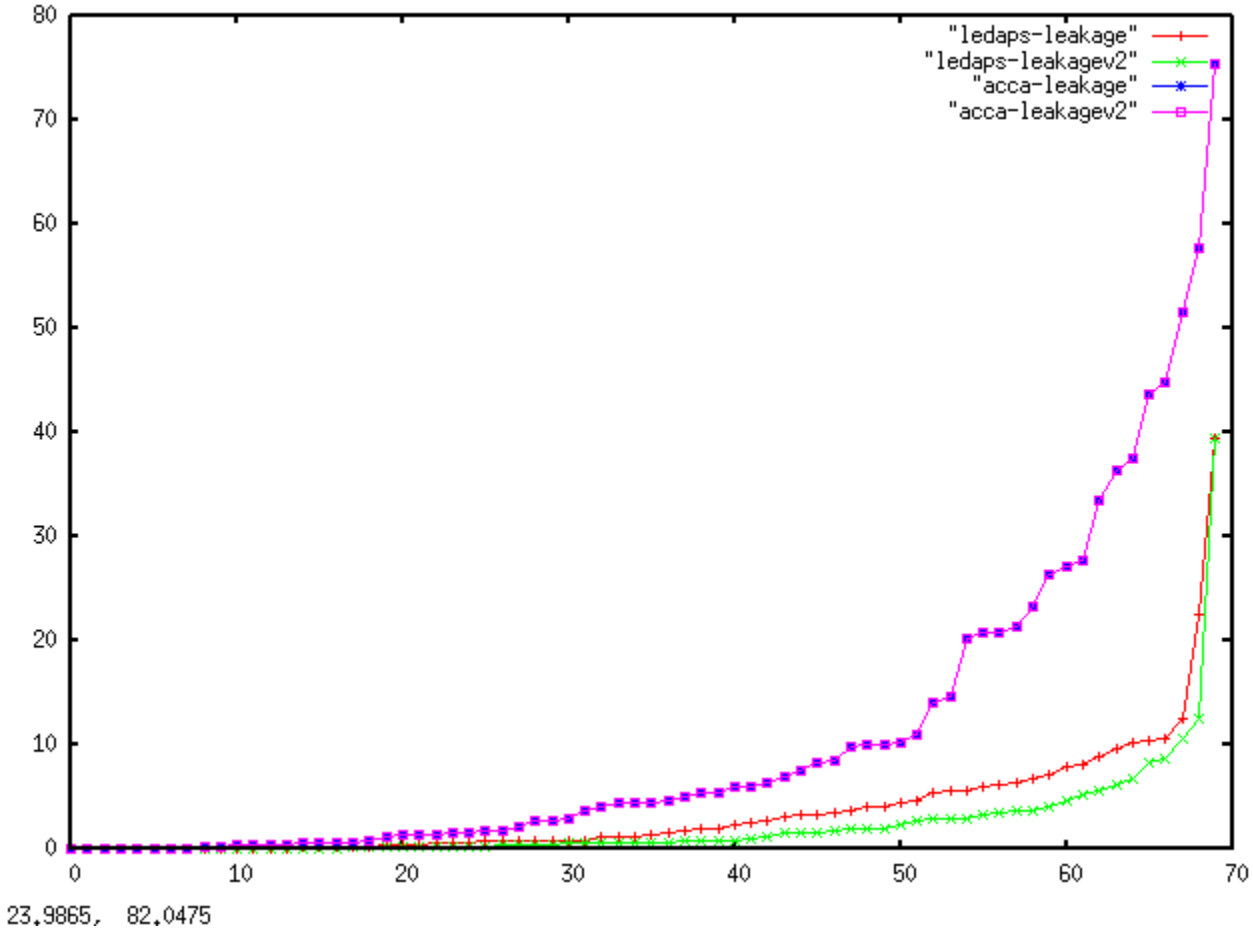
P002R027



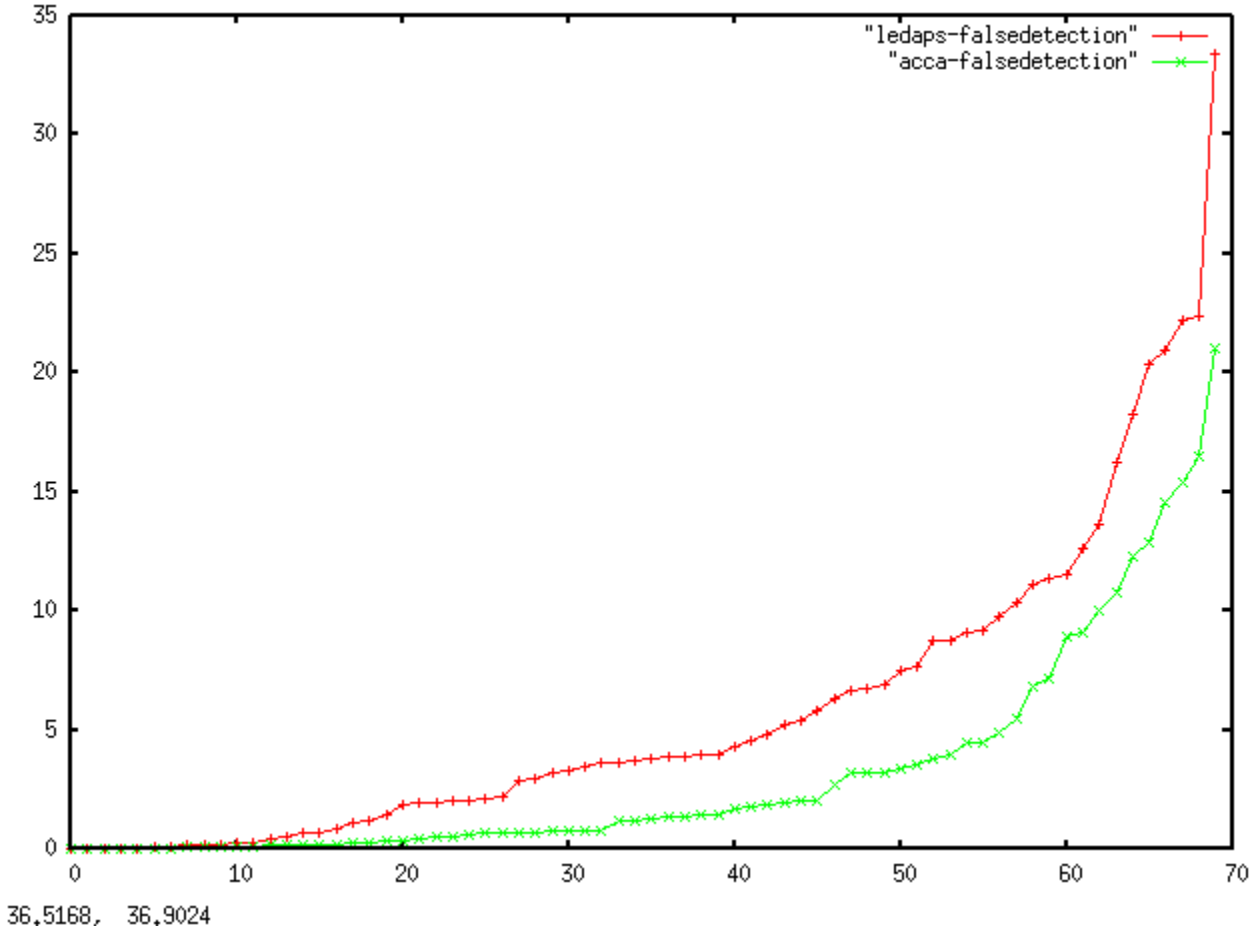
Leakage
39%

This case is still under investigation and is probably related to the use of wrong ancillary data (air temperature)

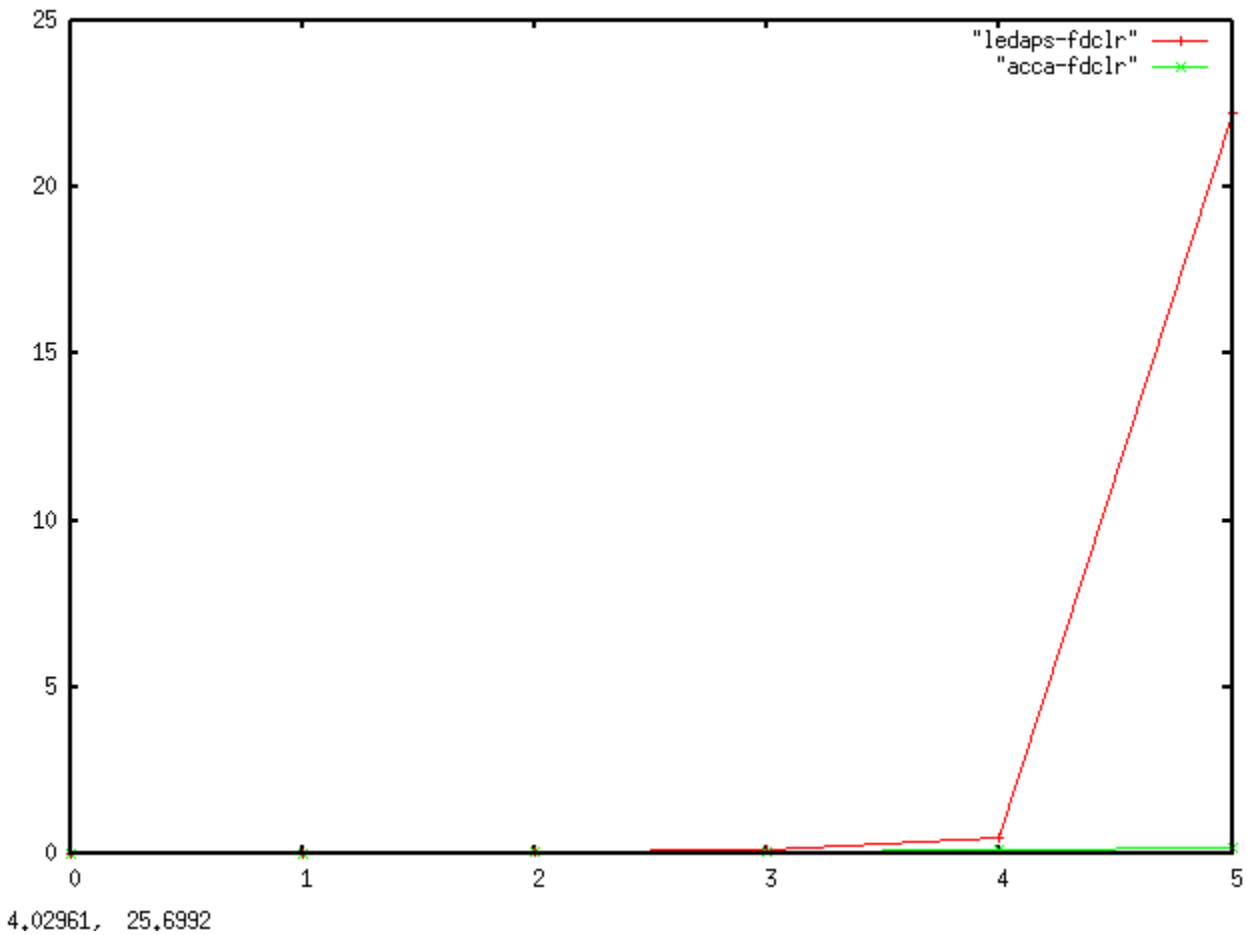
Comparison of leakage rate

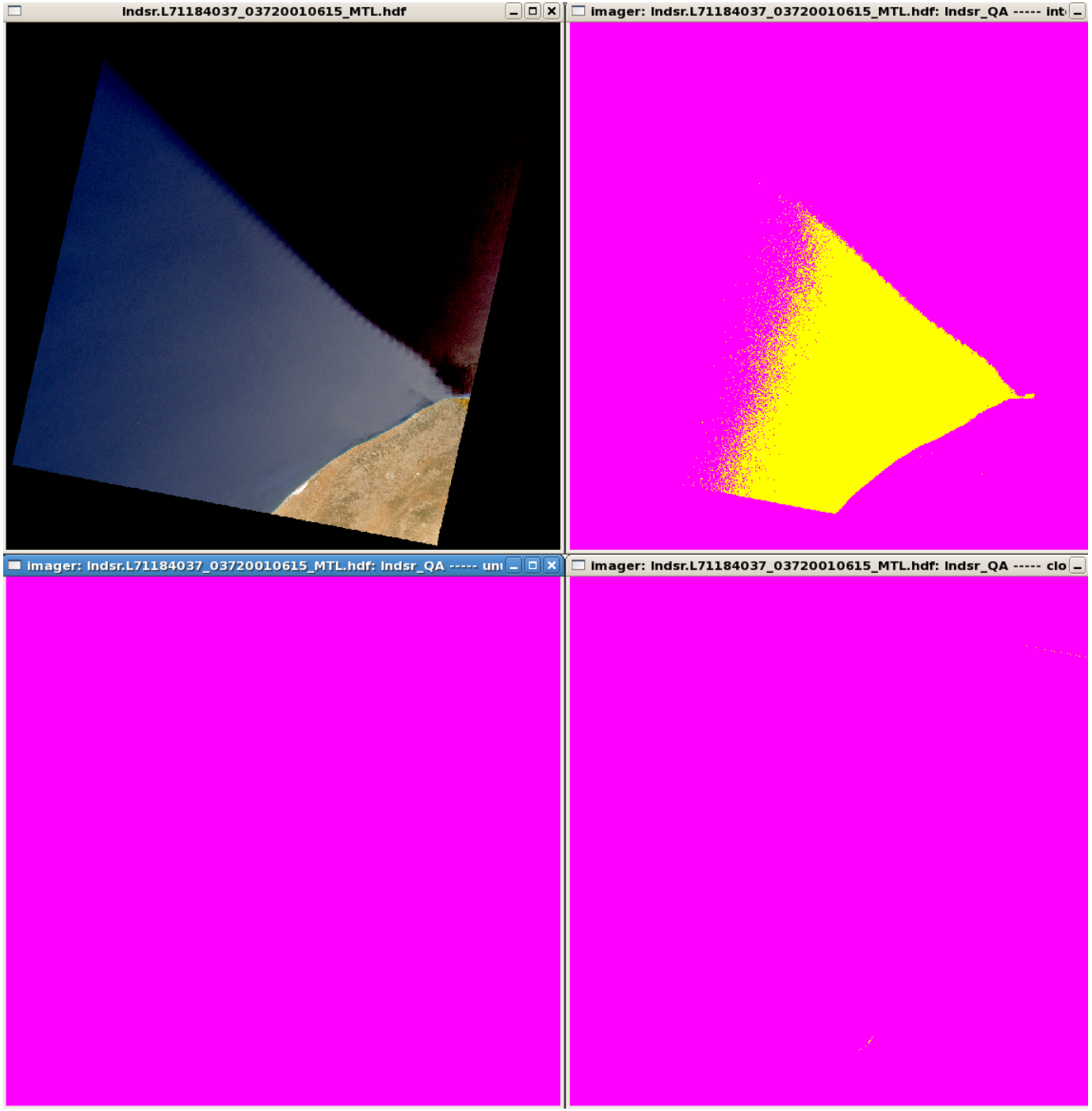


Comparison of false detection rate (all scenes)



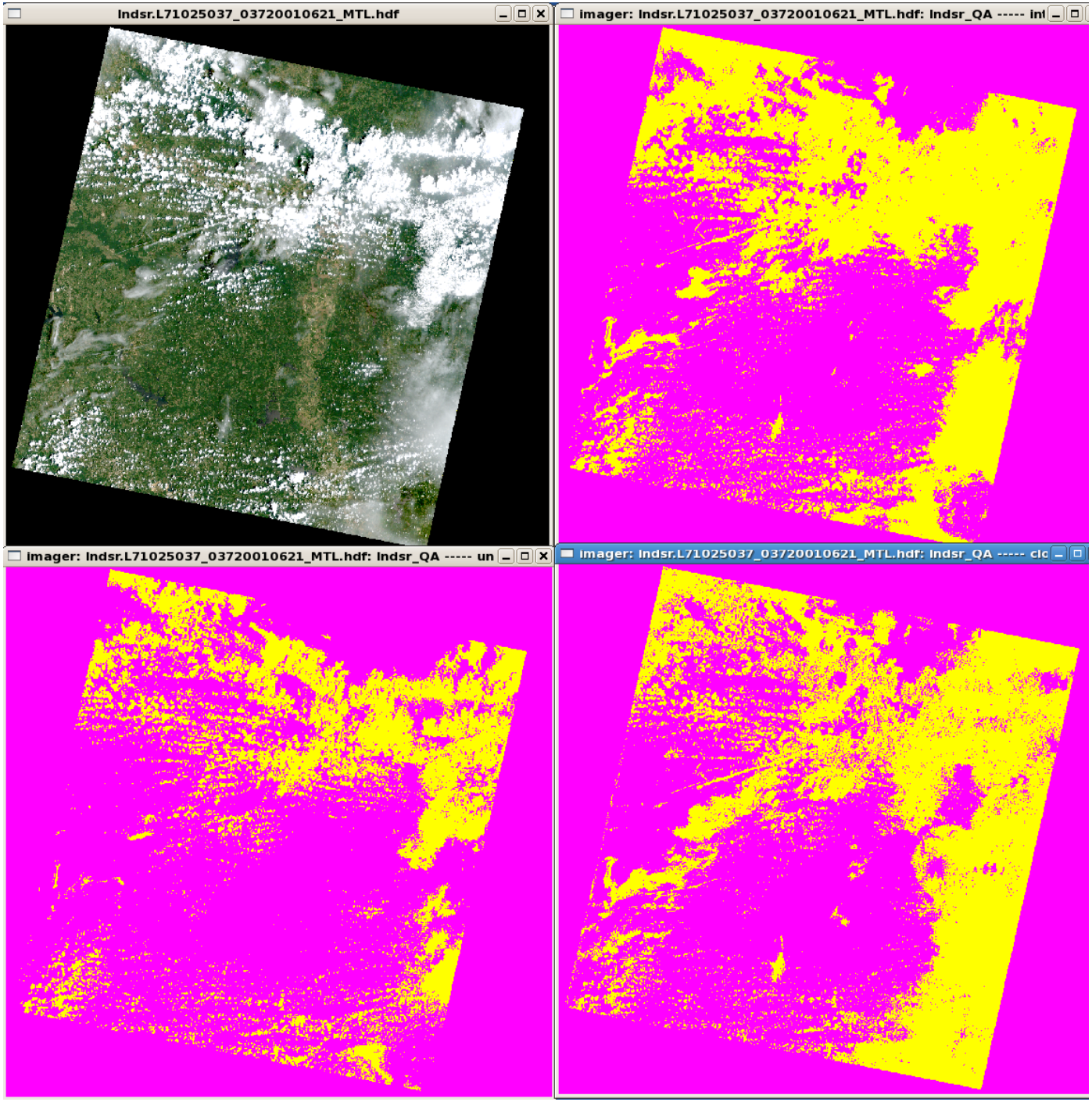
Clear scenes only
False detection rate





P184R37

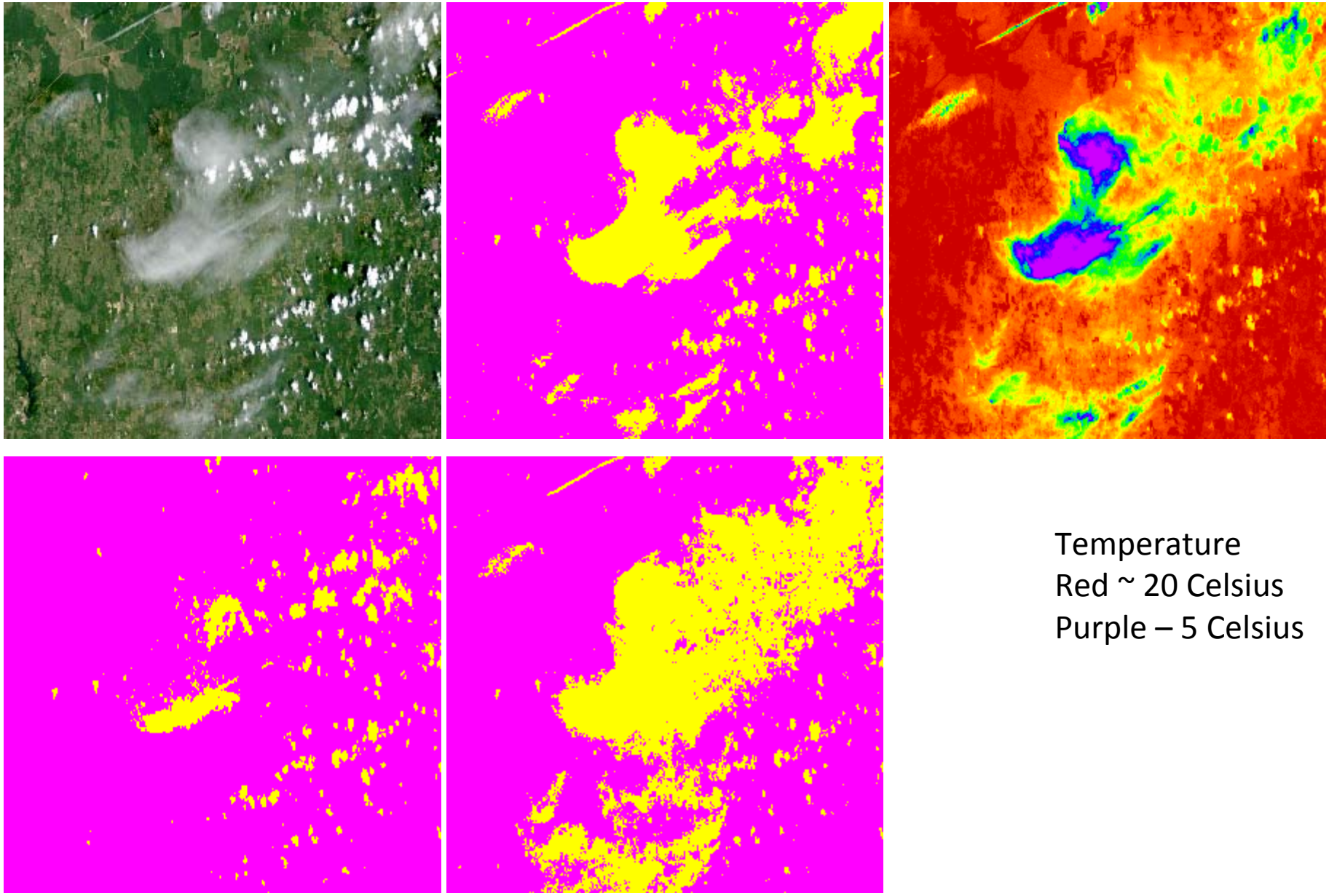
False cloud detection over sunglint



P25R37

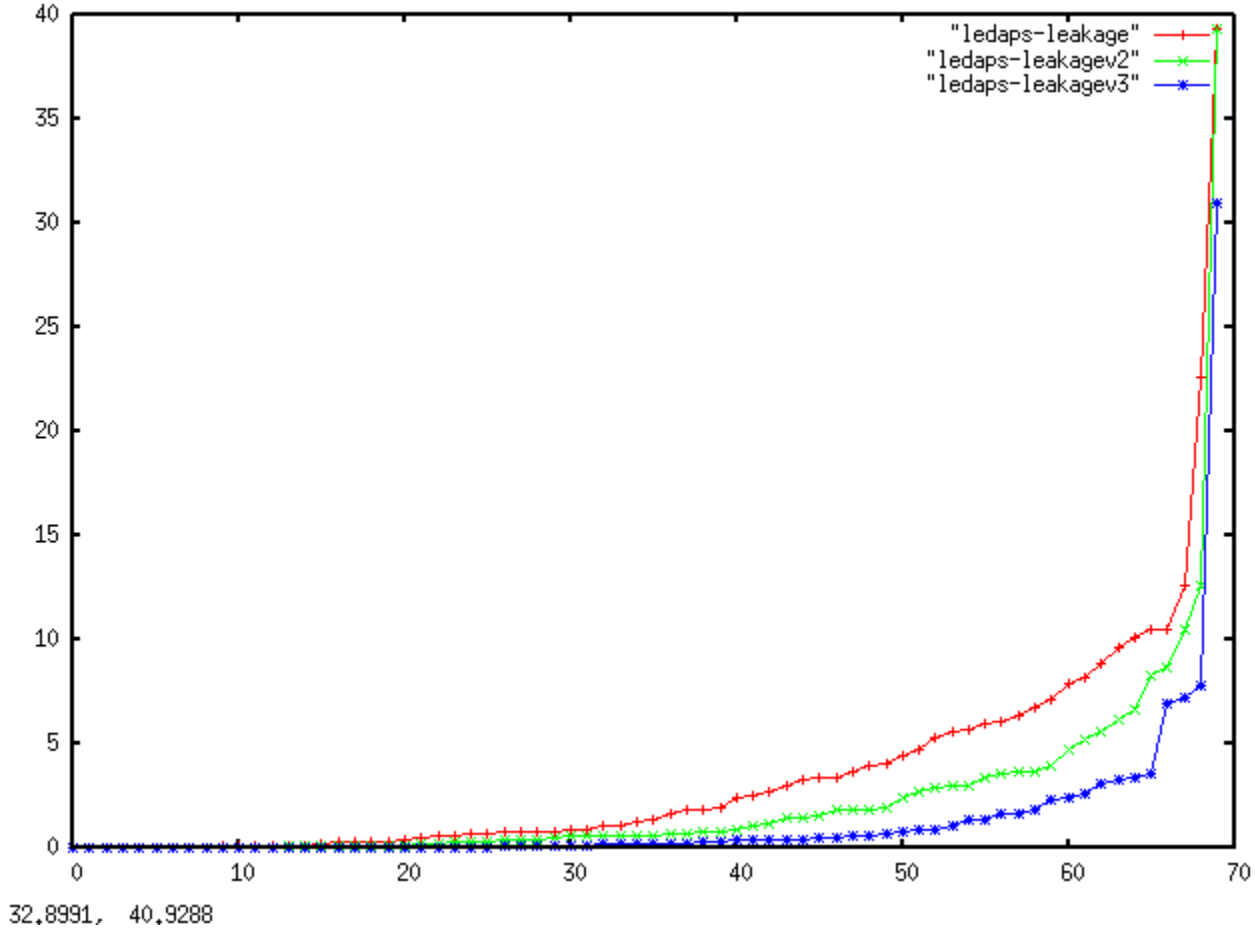
Validation cloud mask is not perfect

Validation cloud mask is not perfect



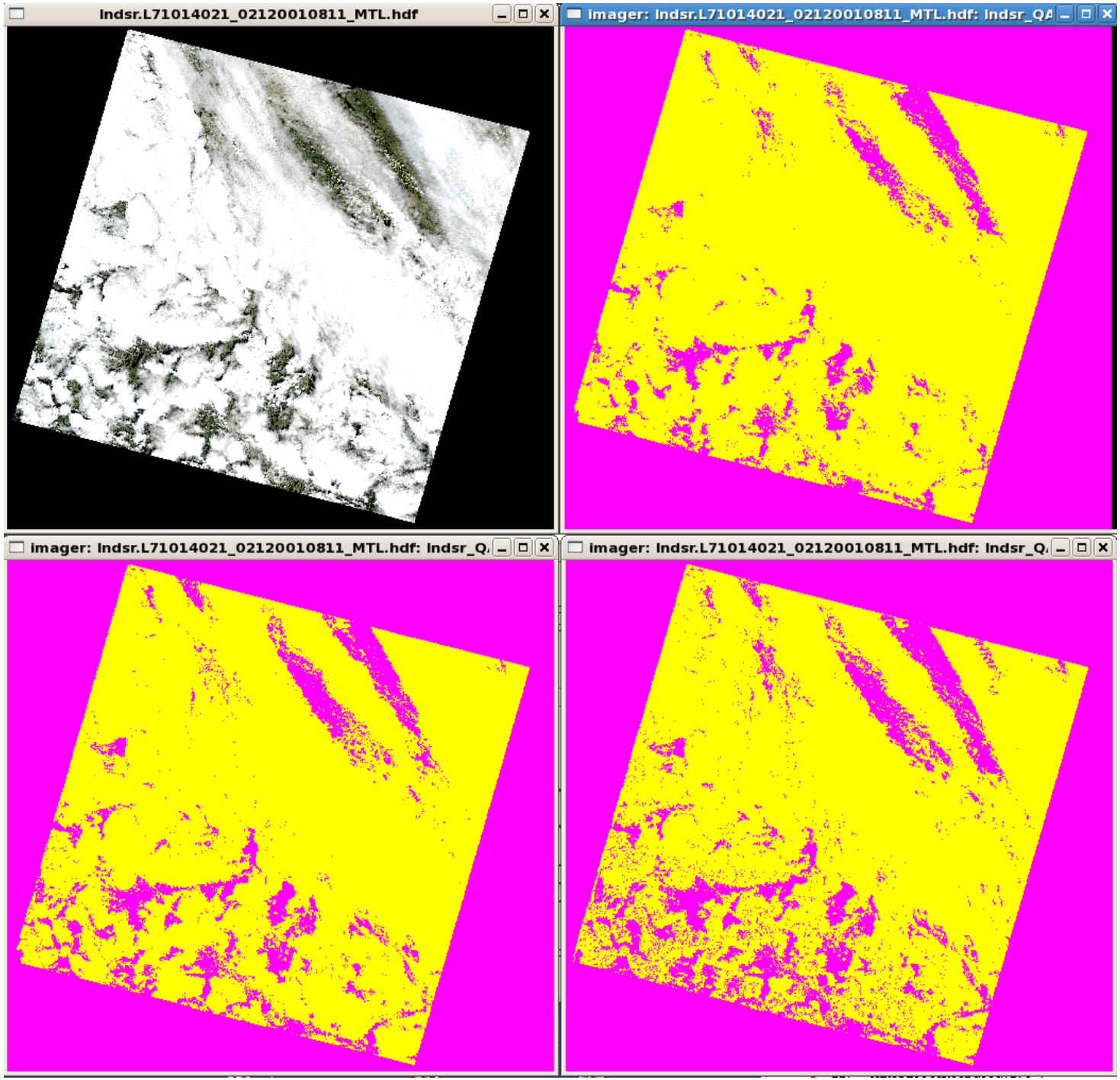
Temperature
Red ~ 20 Celsius
Purple – 5 Celsius

Including adjacent to cloud as cloud decreases leakage



Conclusions

- The evaluation of the Landsat SR product versus MODIS is good and more product metrics can be derived from this dataset (e.g. APU).
- The LEDAPS internal cloud mask is conservative for cloudy scenes and performing well for clear scenes except in a few instances (sunglint, turbid water).
- The validation cloud mask needs to be revised in a few cases.
- Cloud shadow mask validation is still an issue.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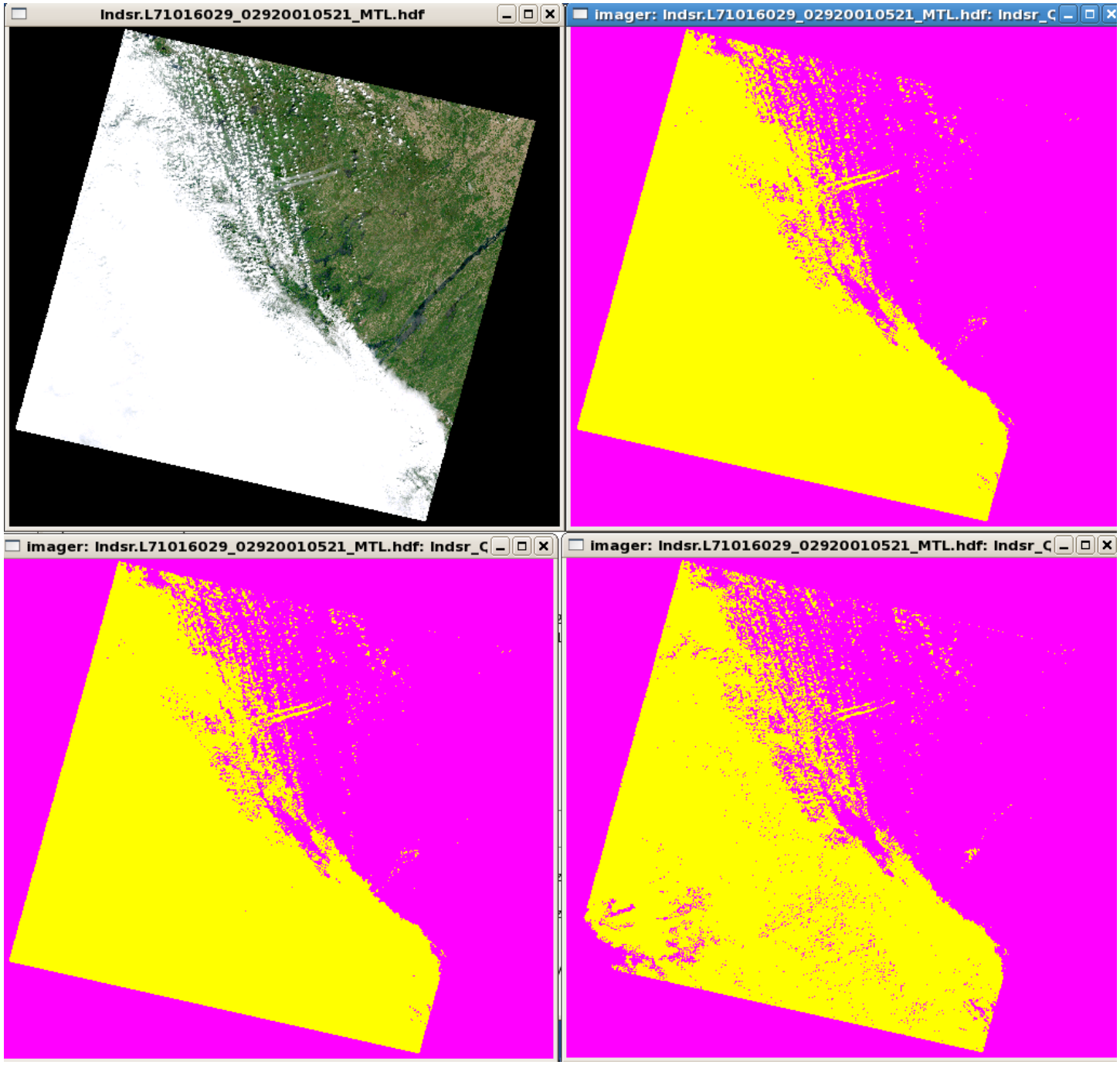
P14R21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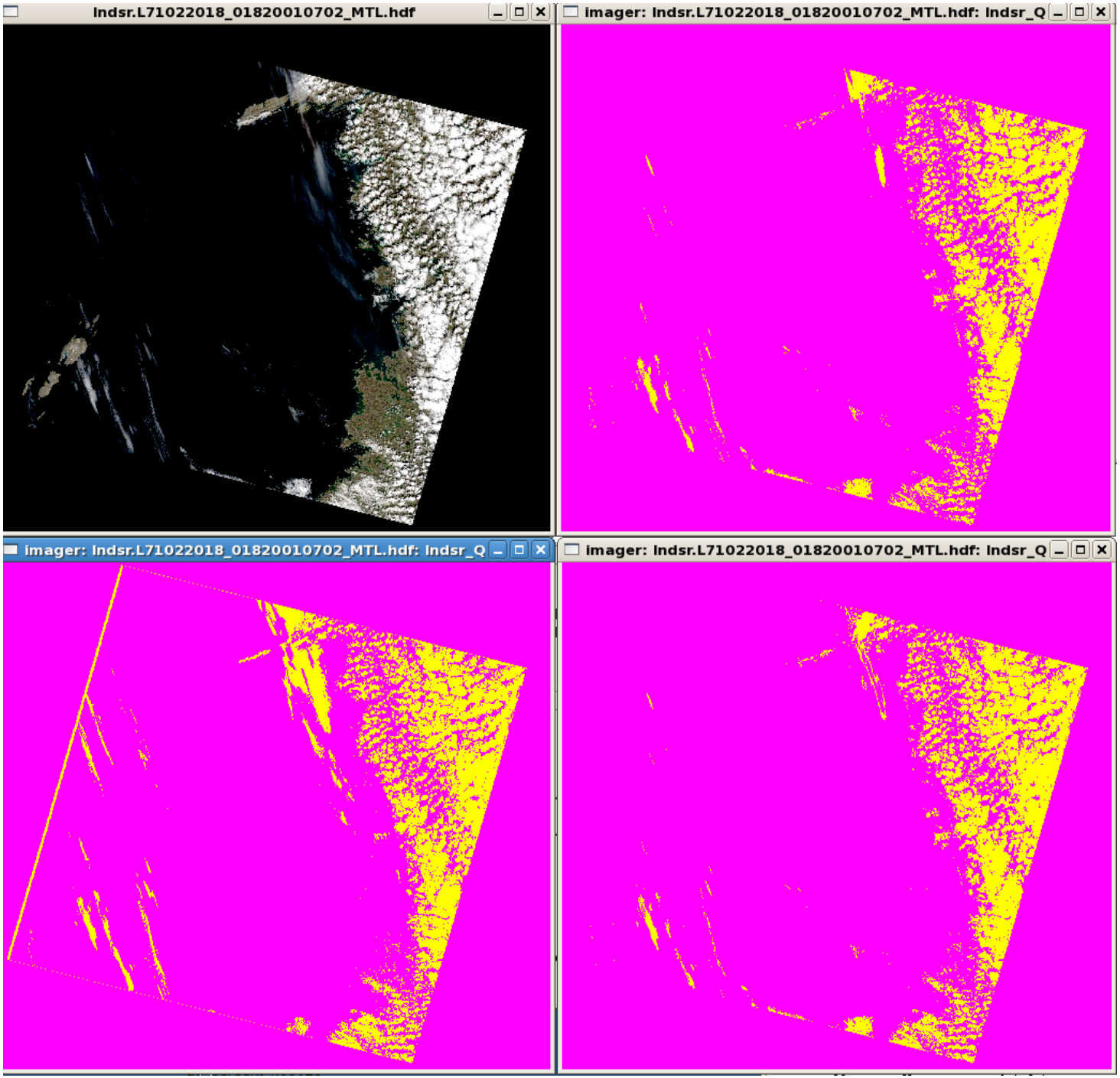
P16R29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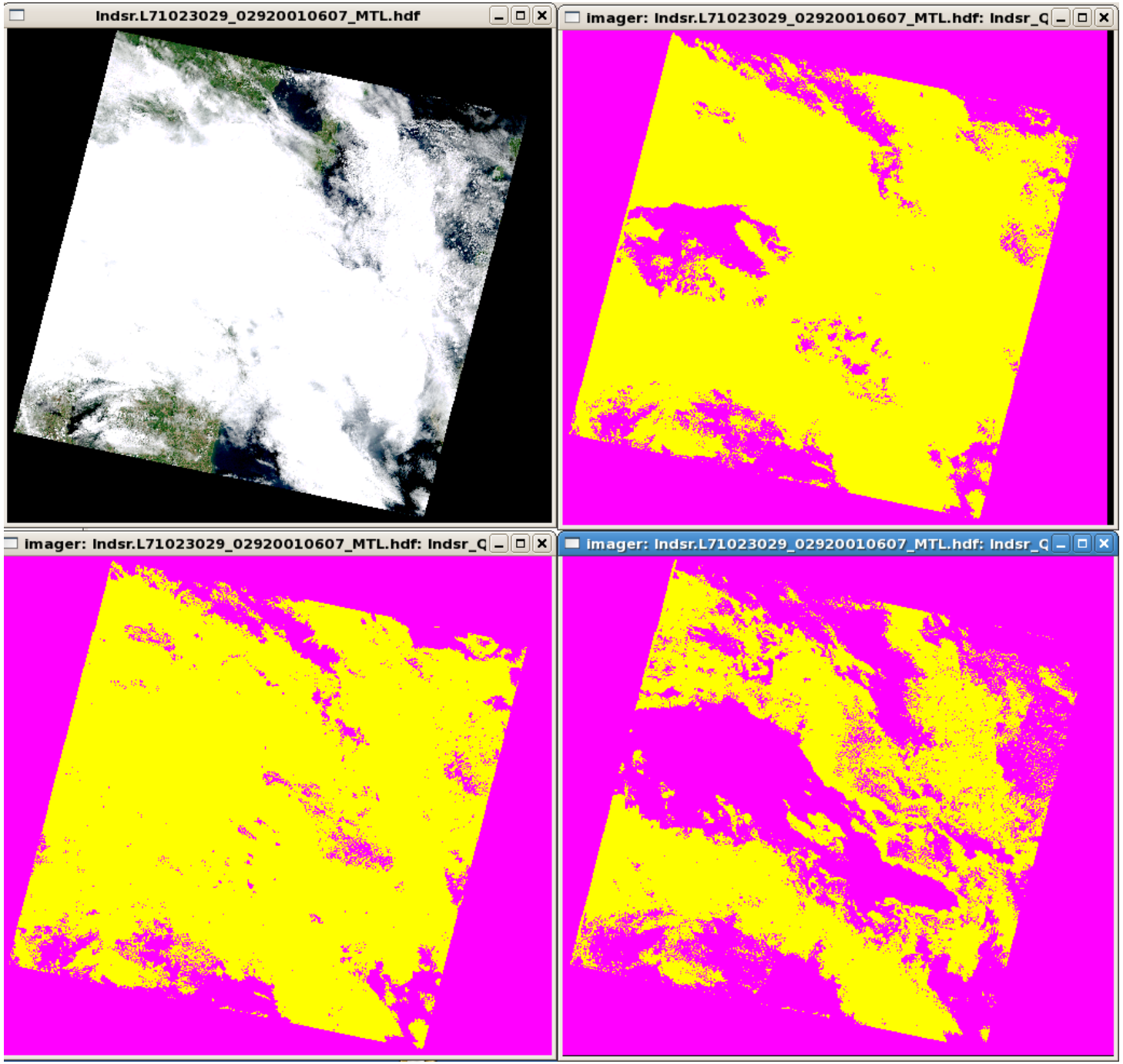
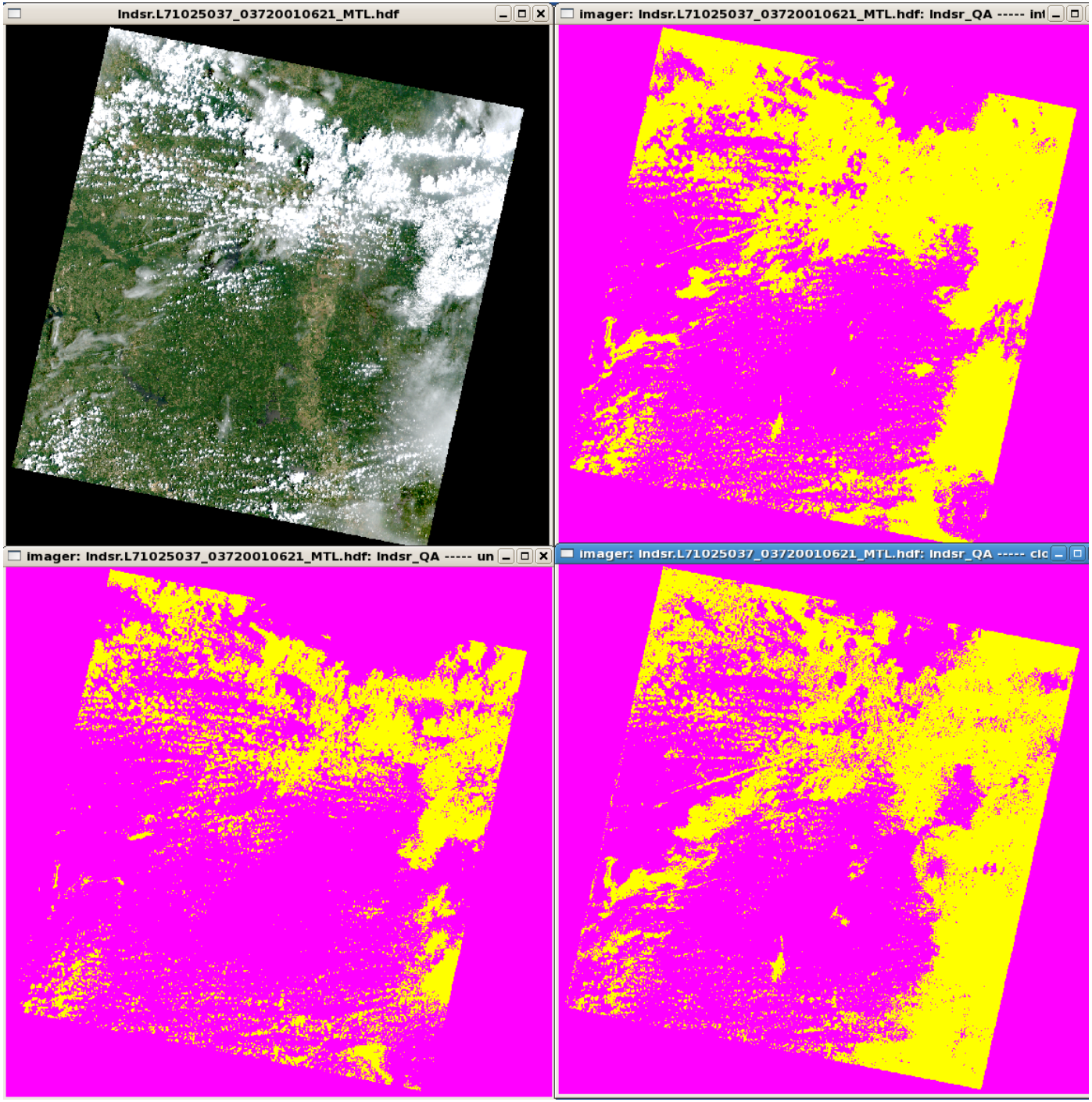
P22R18



P23R29

Leakage
7%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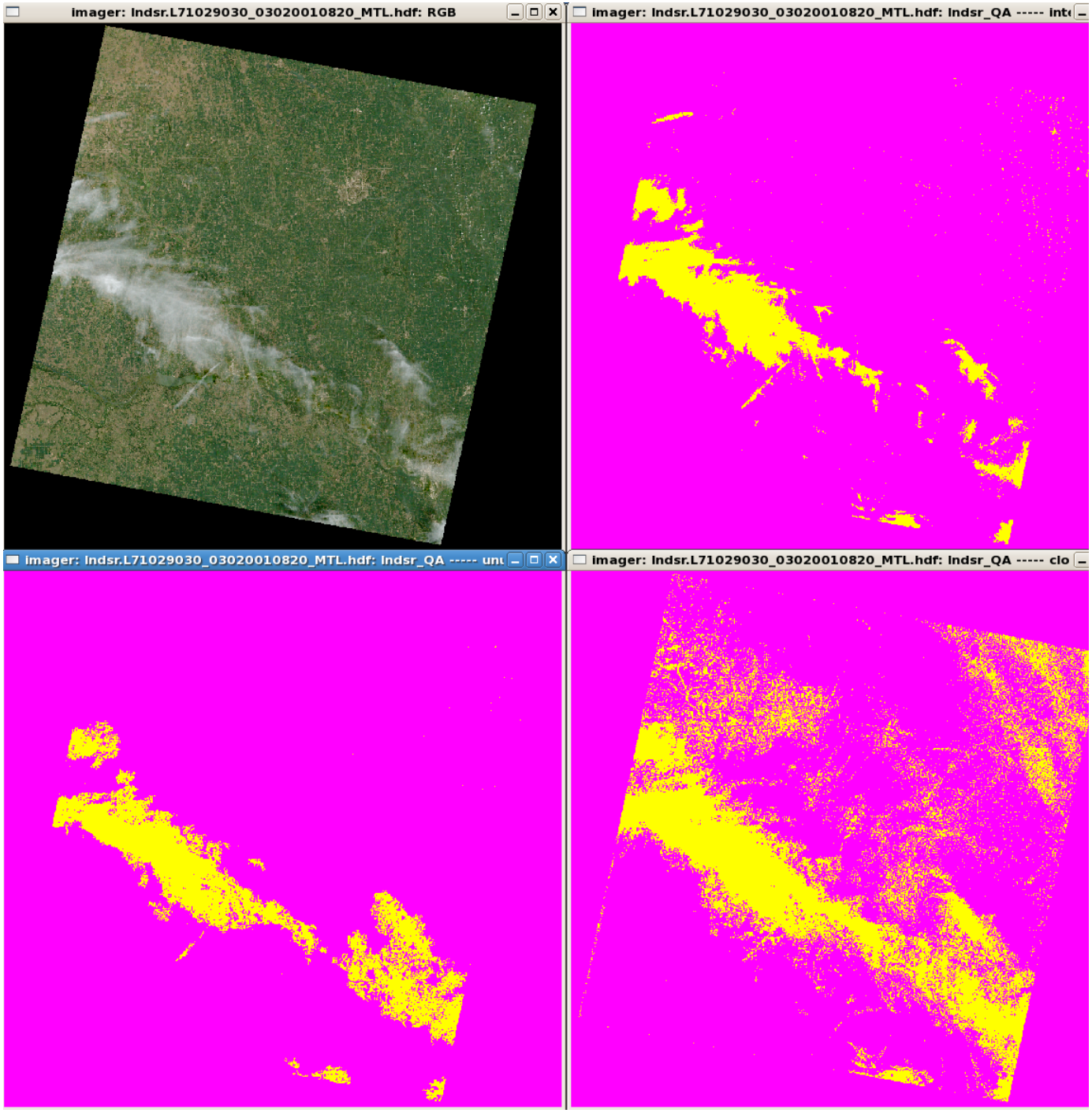
P25R37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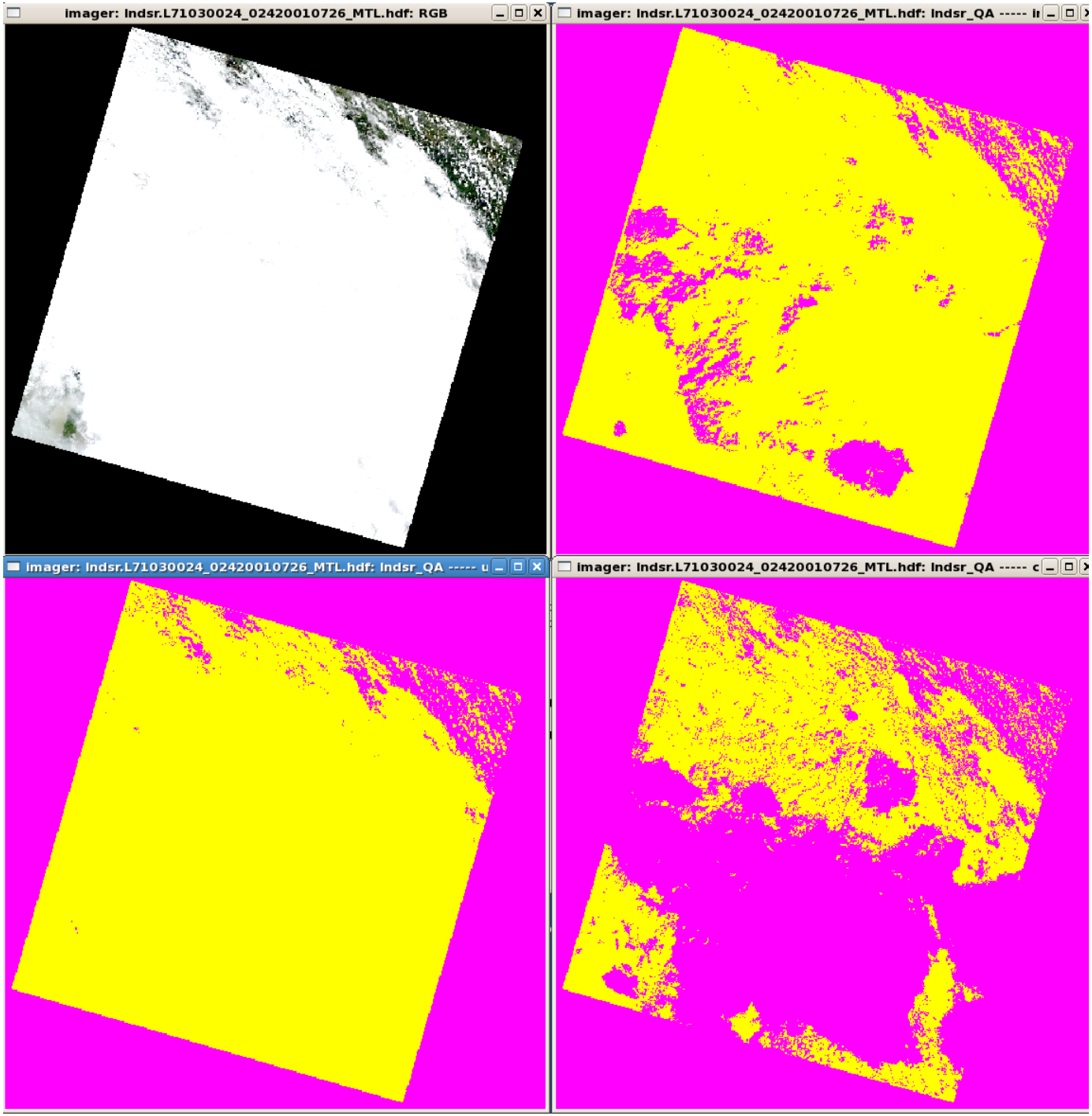
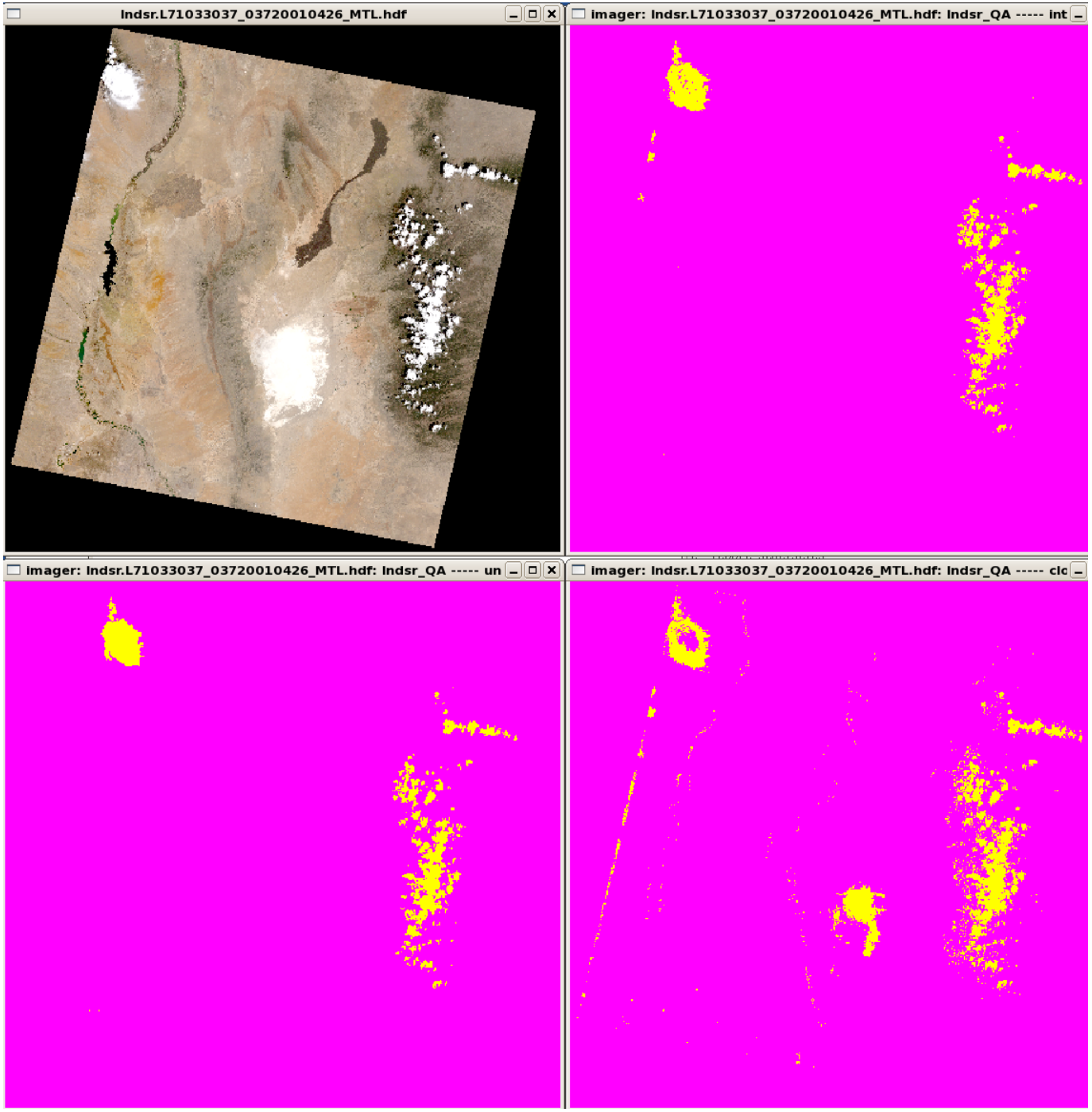
P29R30



P30R24

Leakage
8%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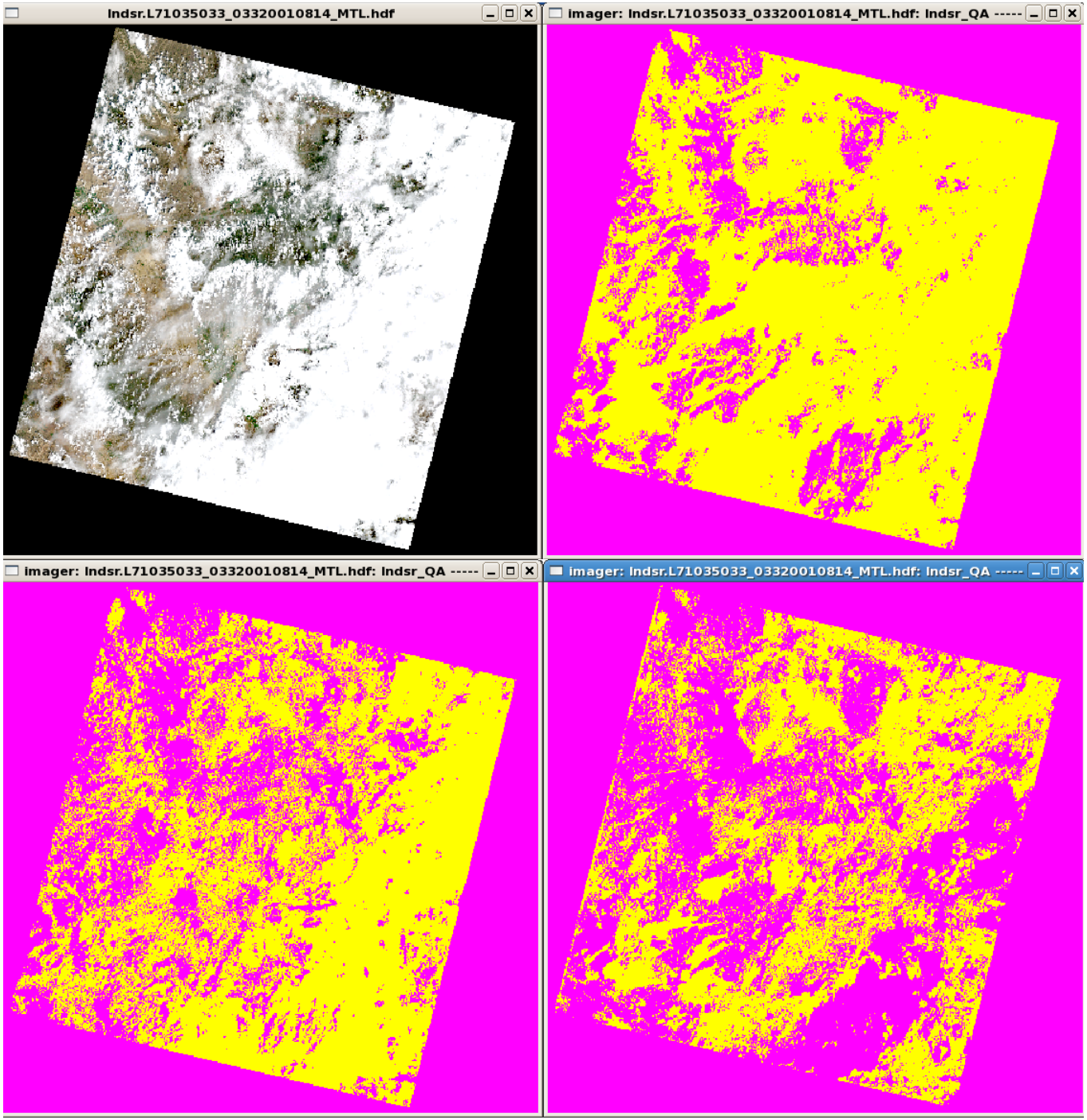
P33R37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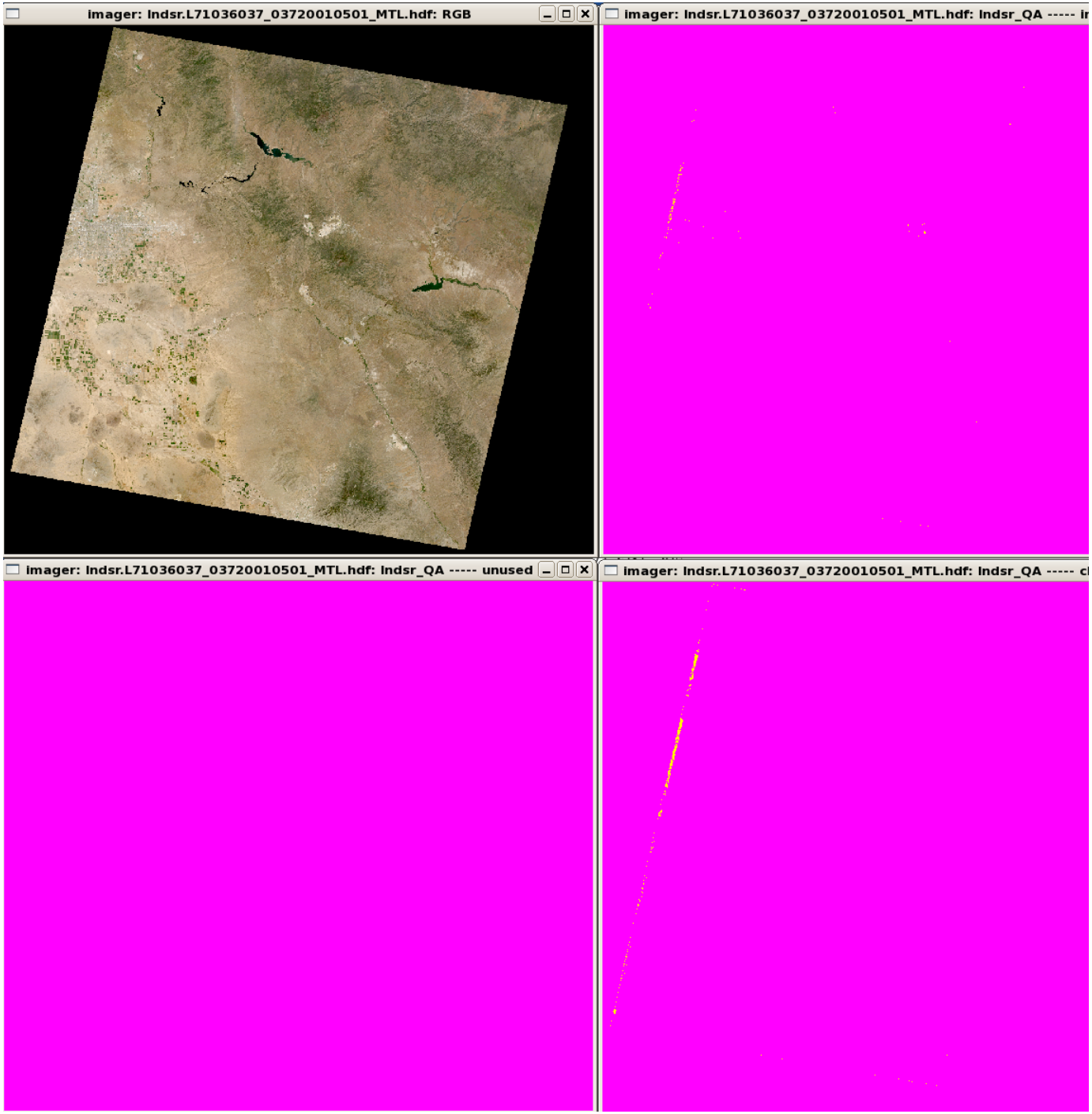
P35R33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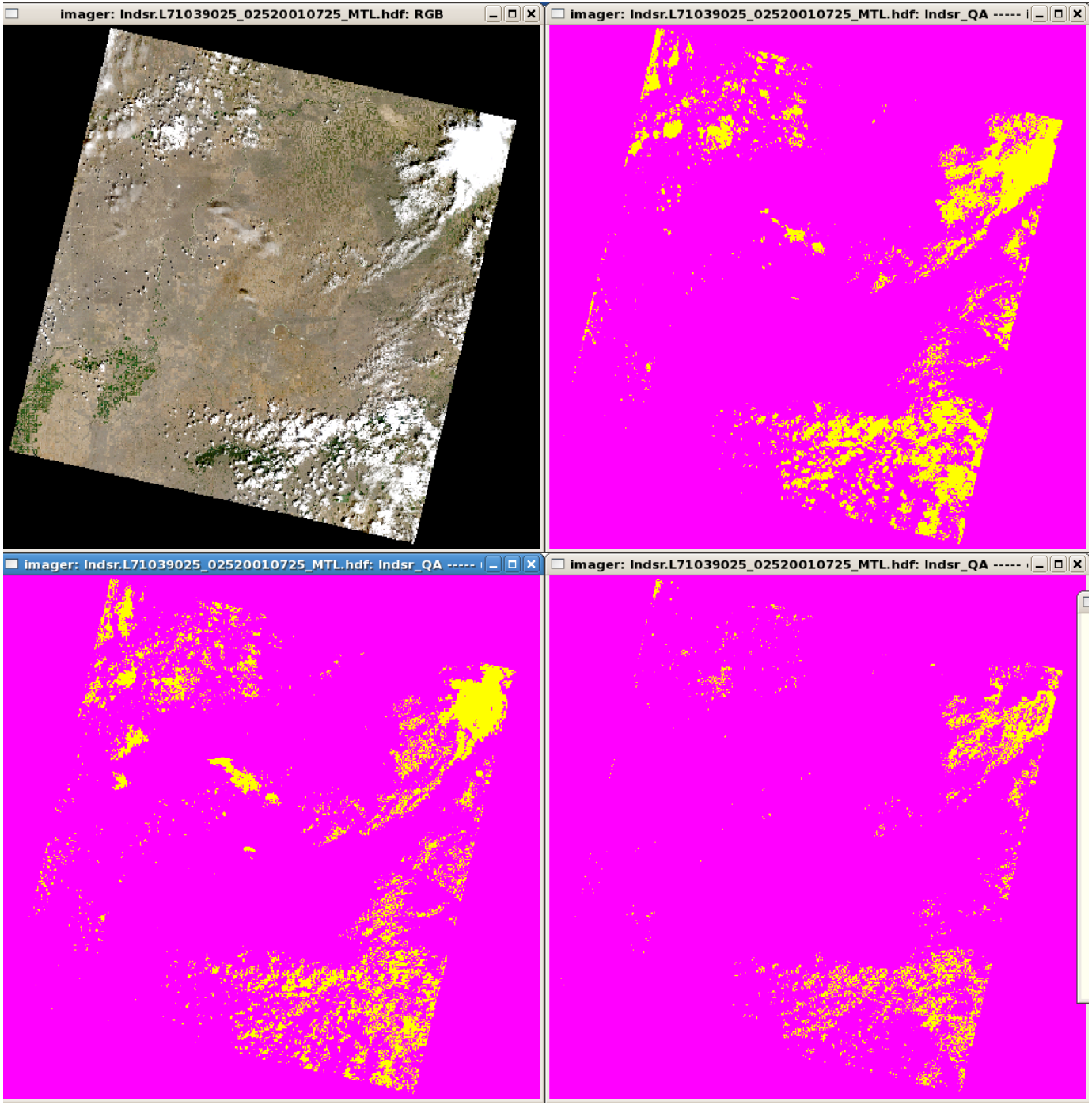
P36R37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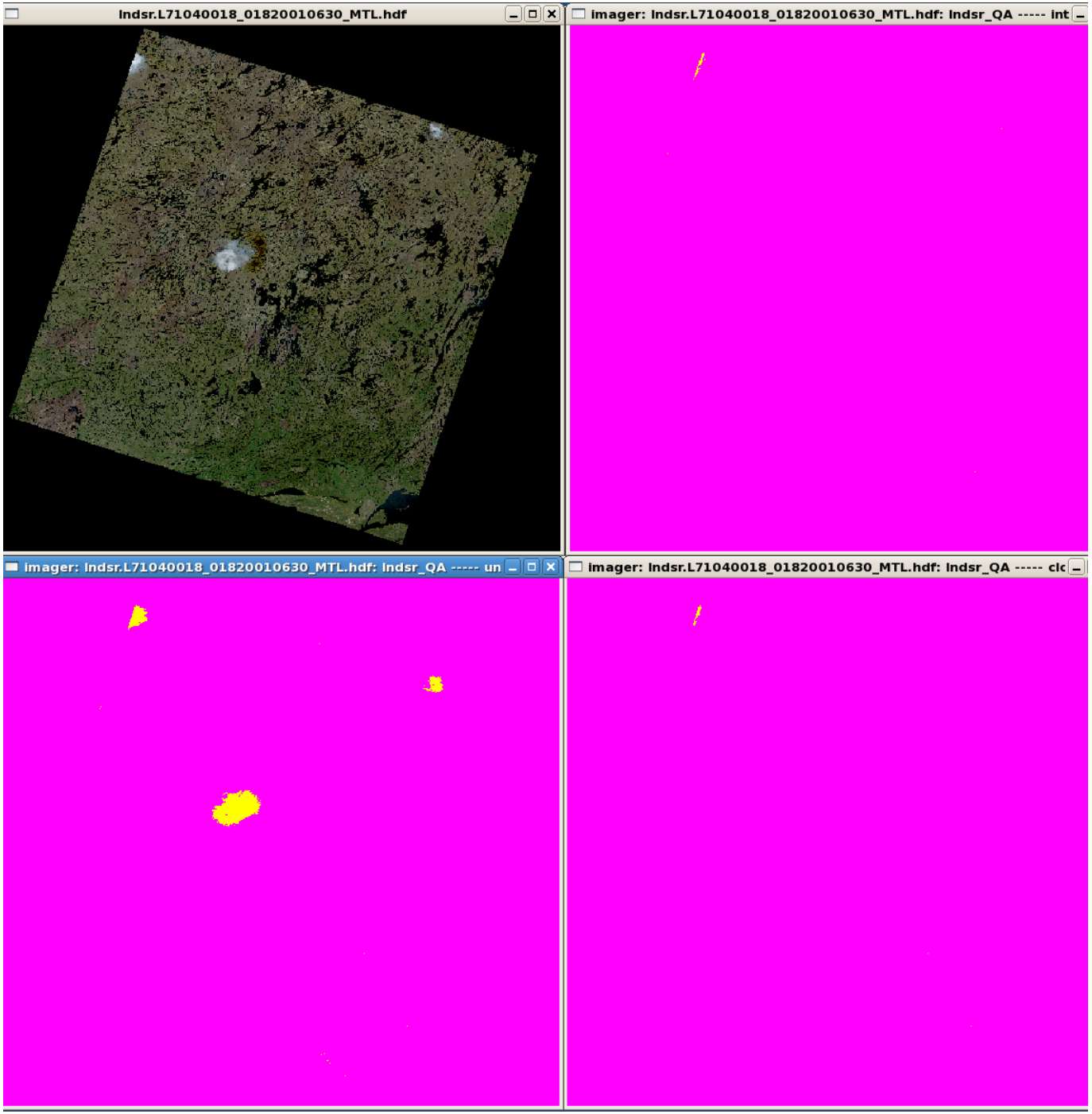
P39R25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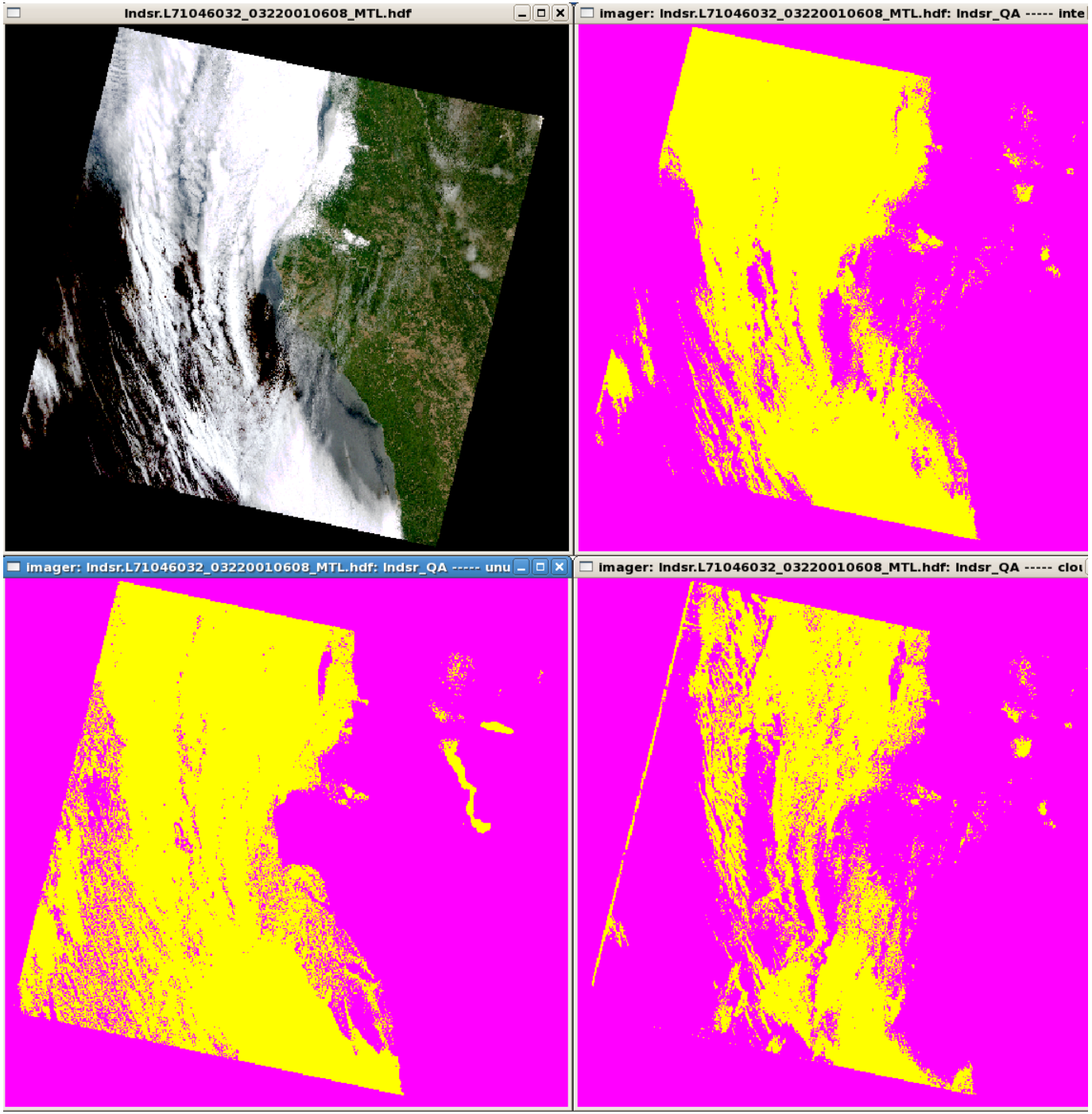
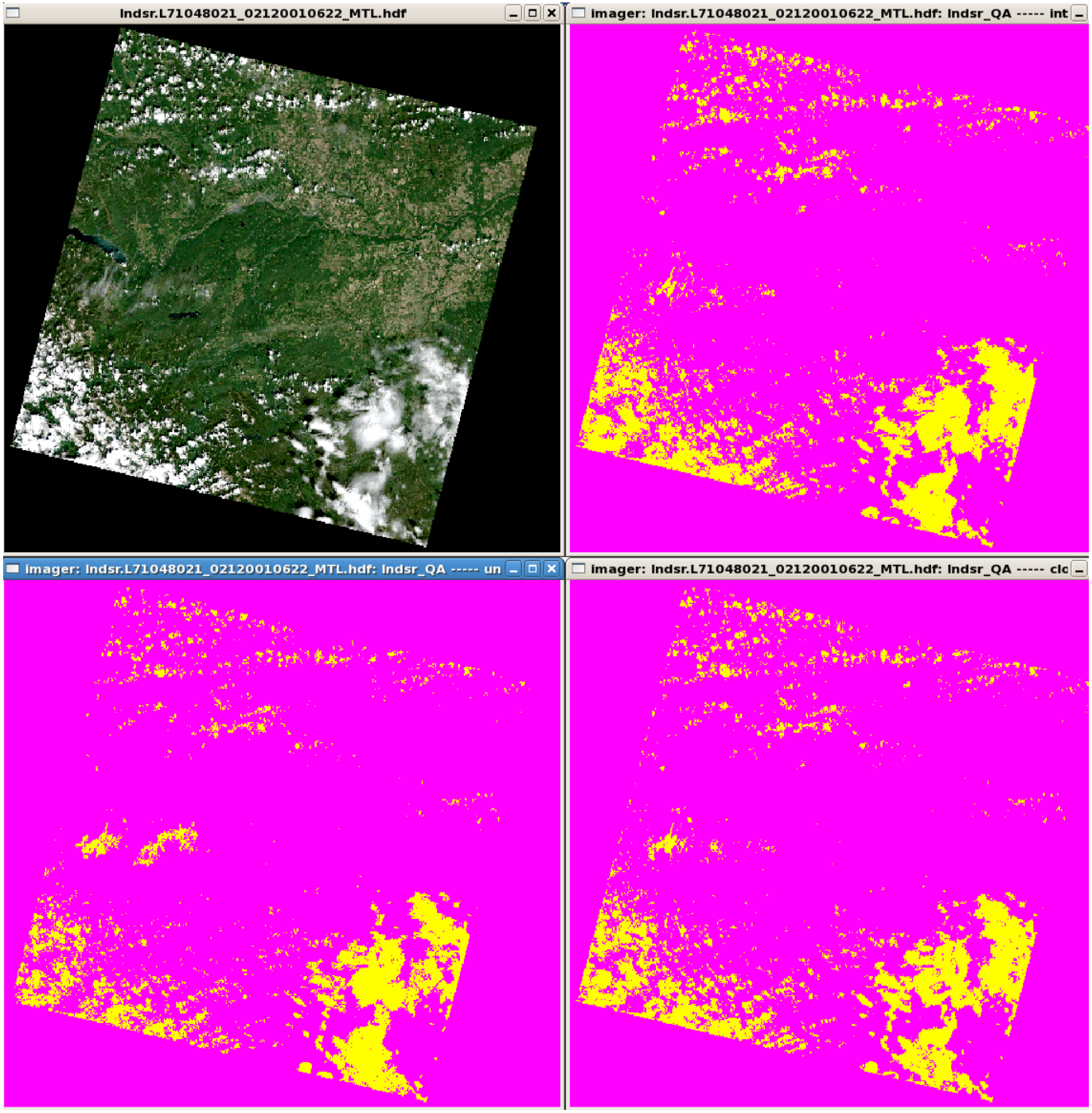
P40R18



P46R32

Leakage
12%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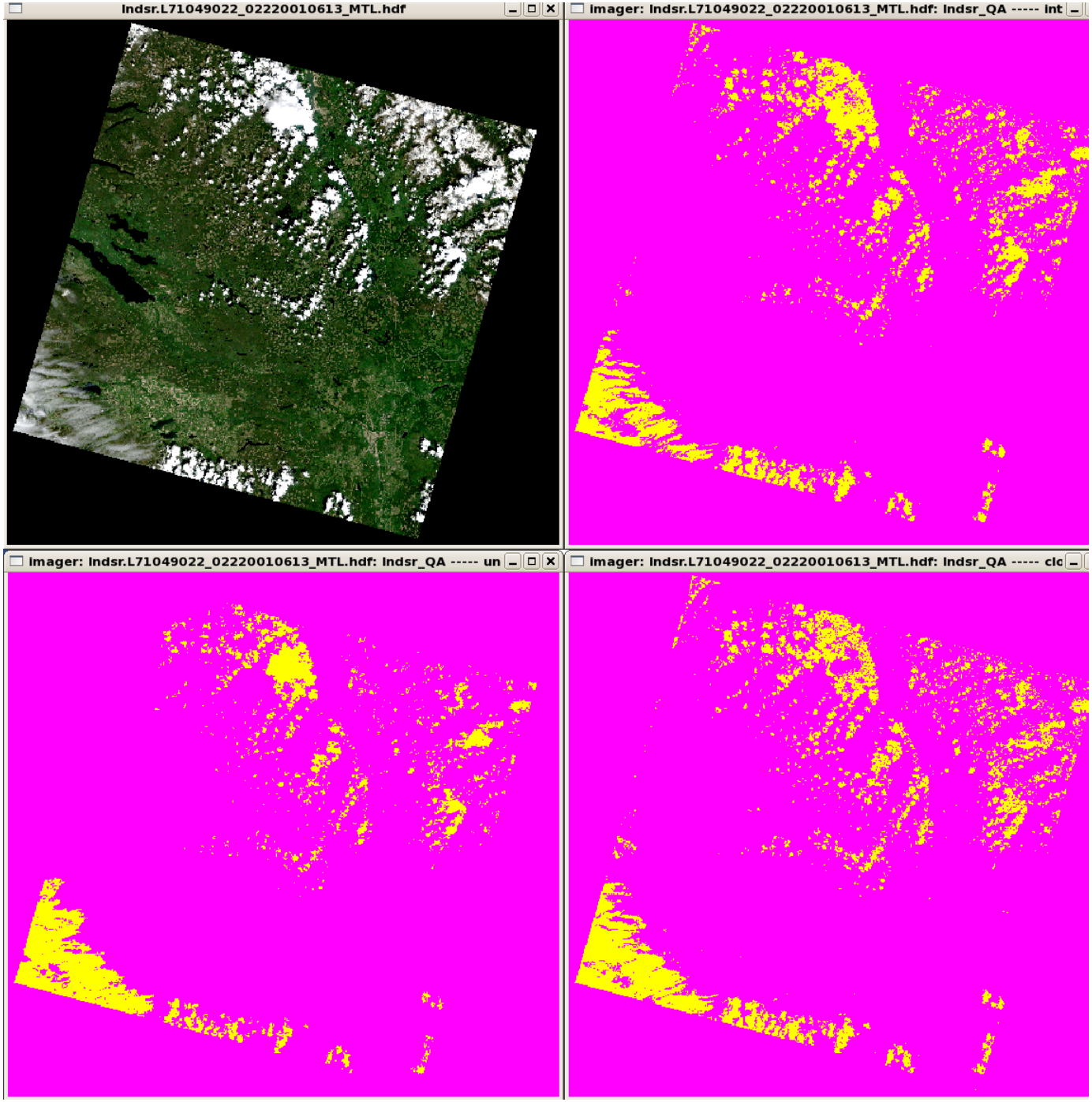
P48R21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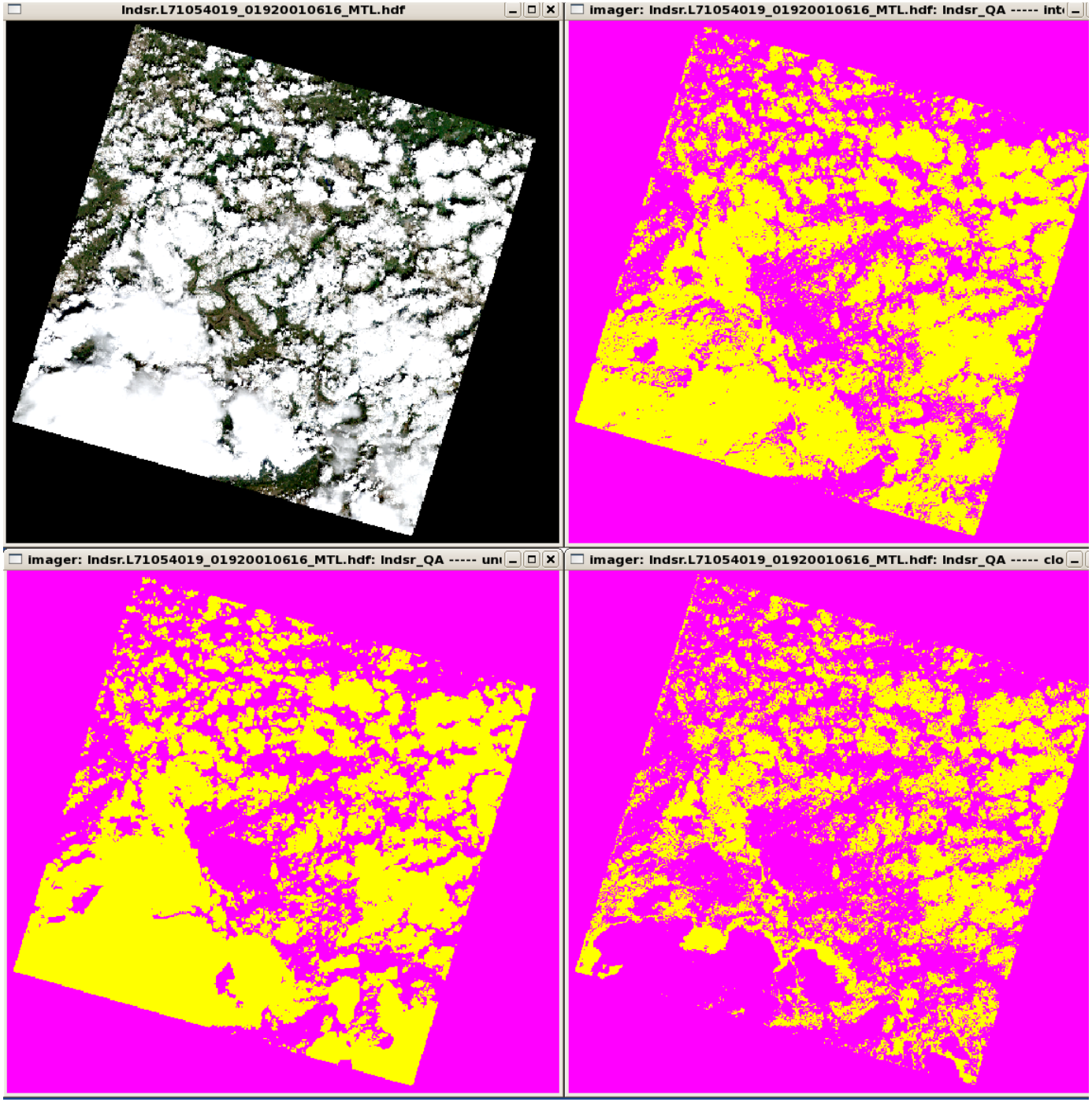
P49R22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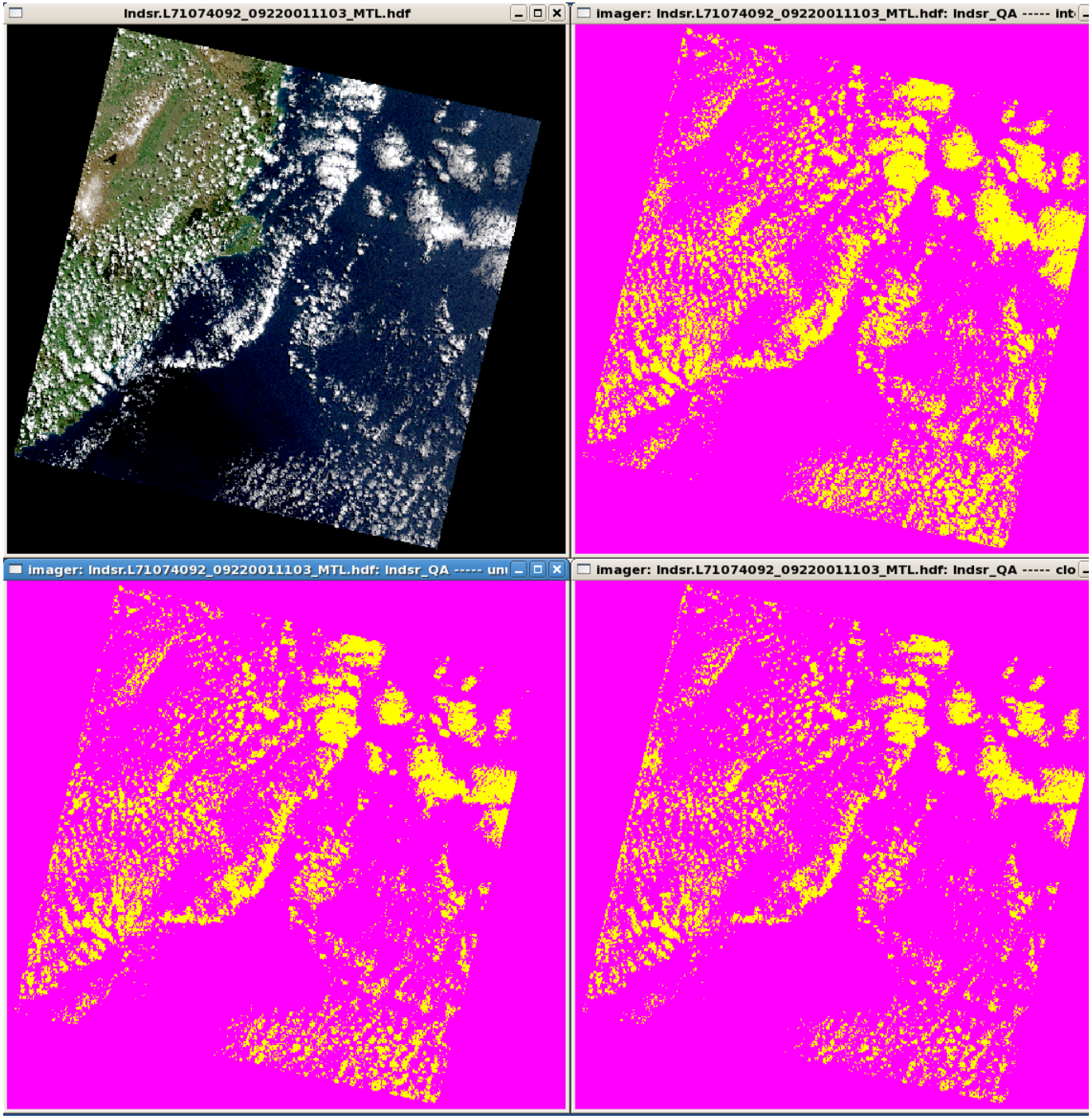
P54R19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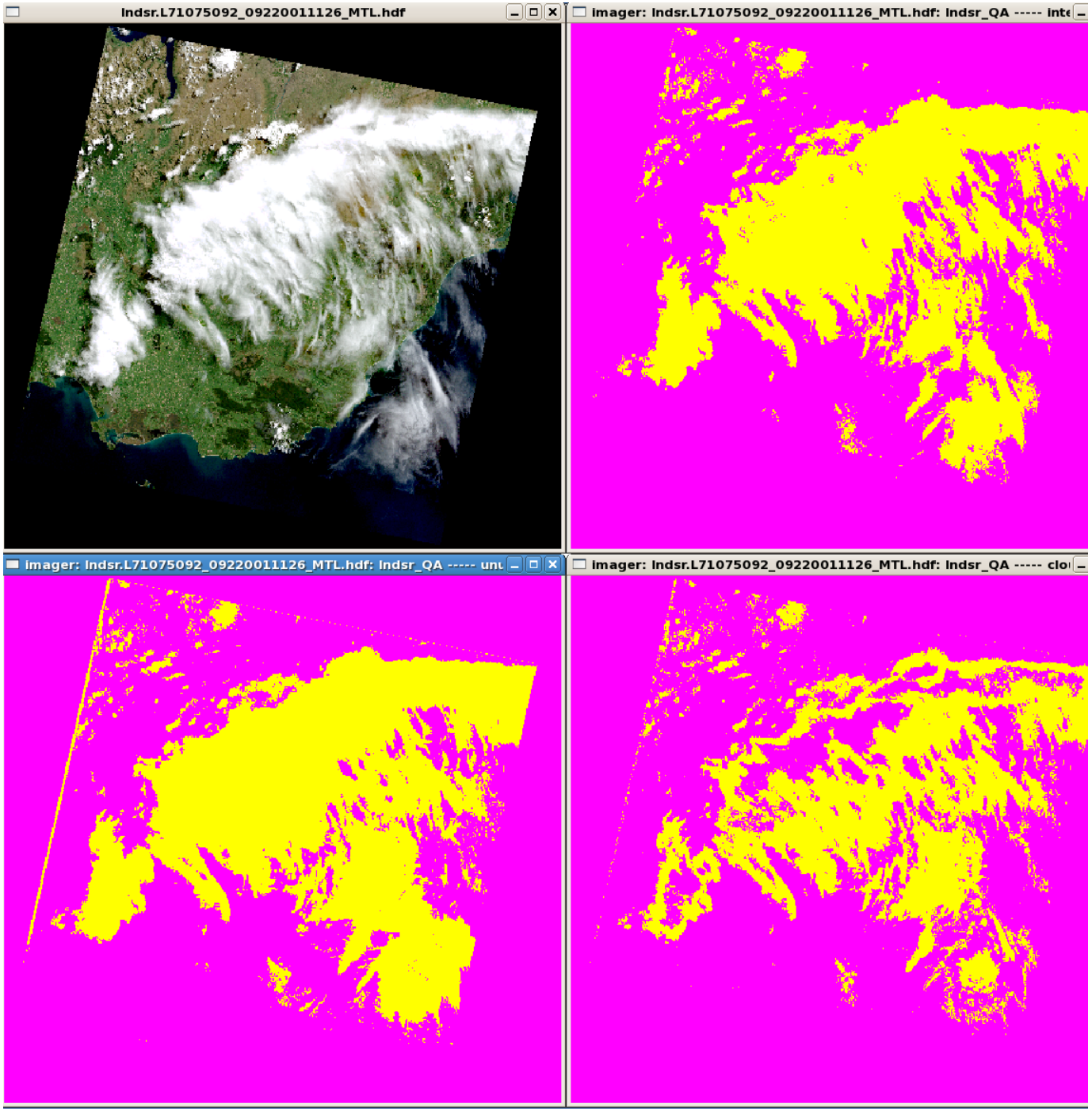
P74R92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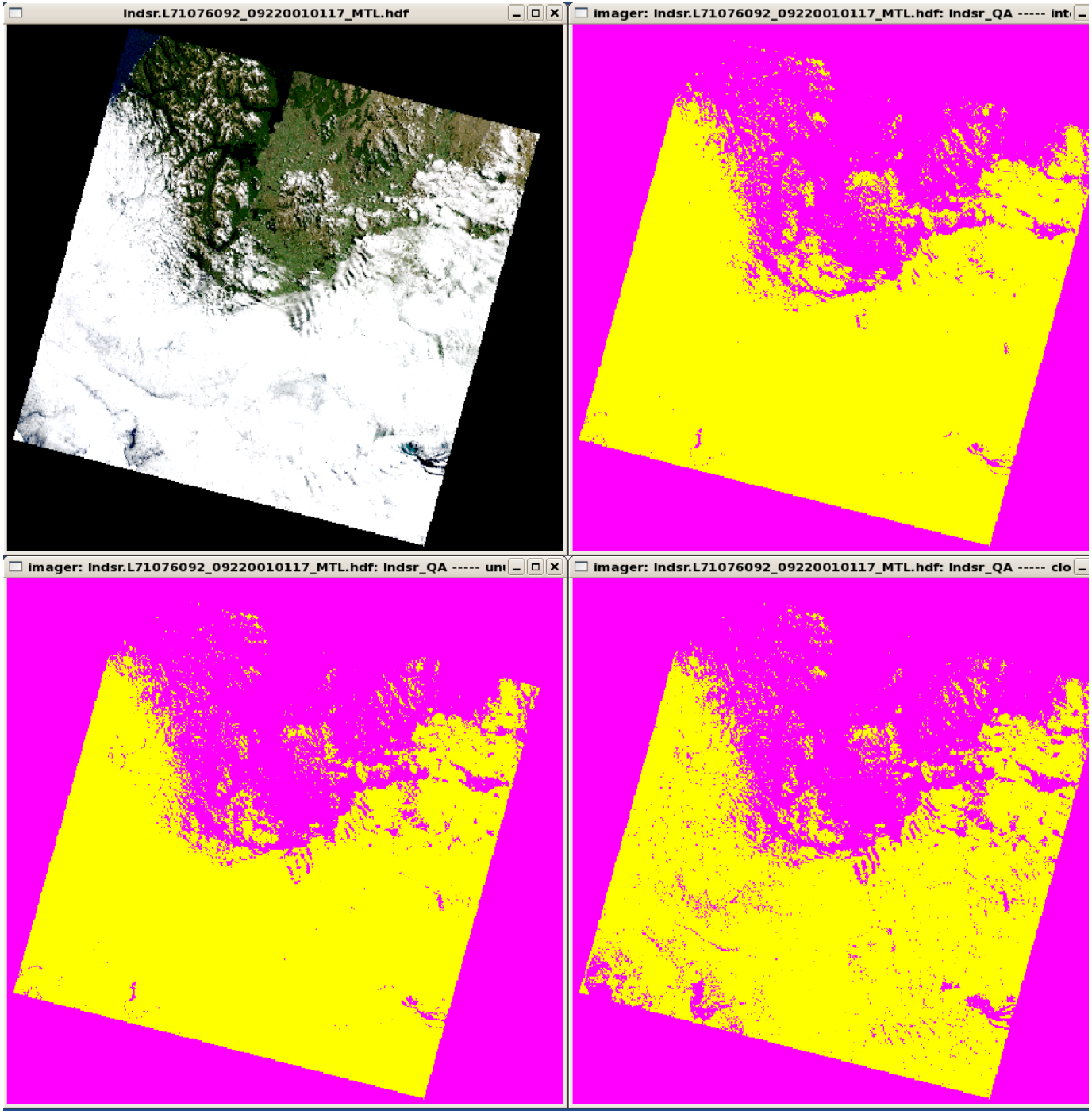
P75R92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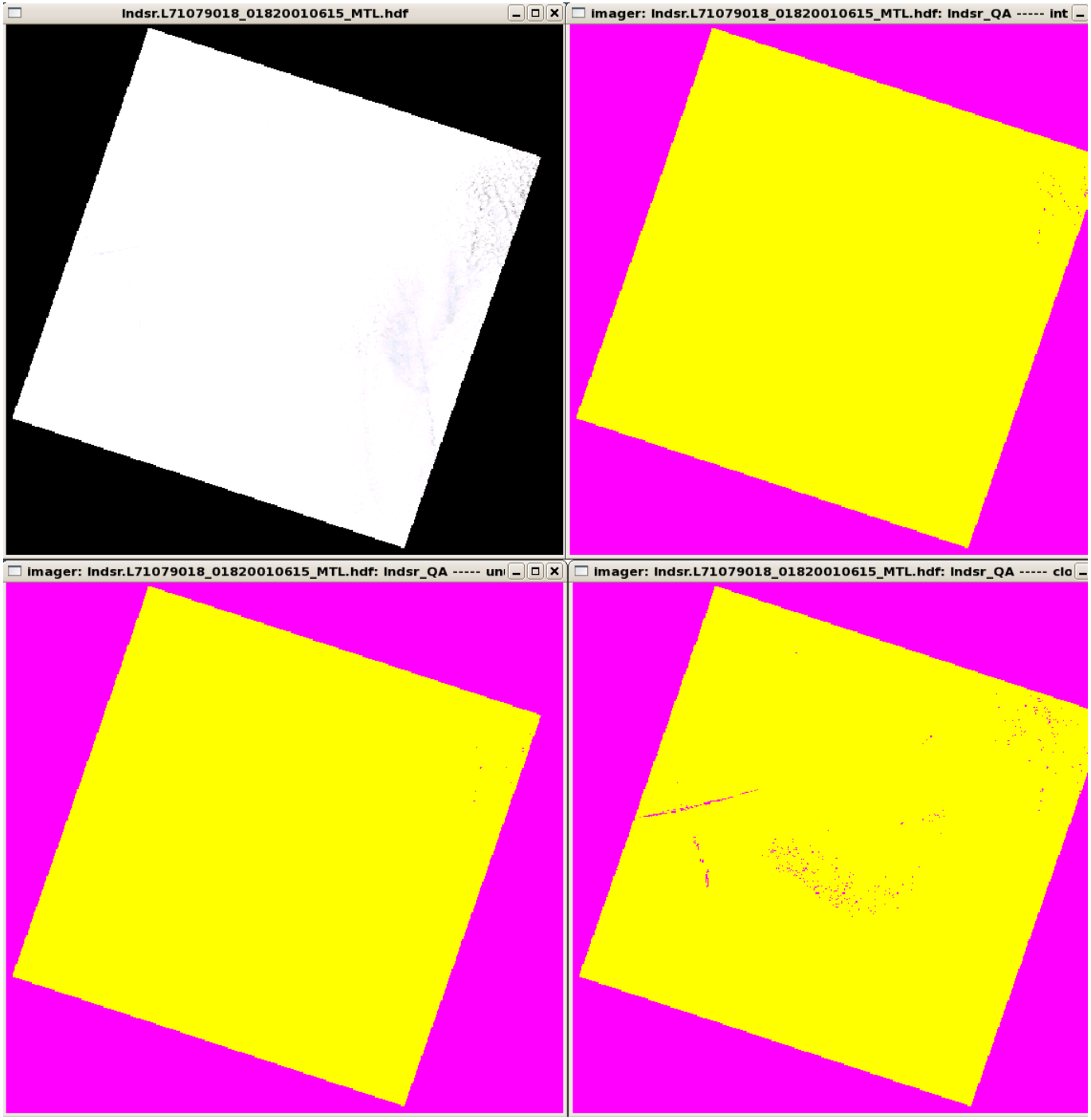
P76R92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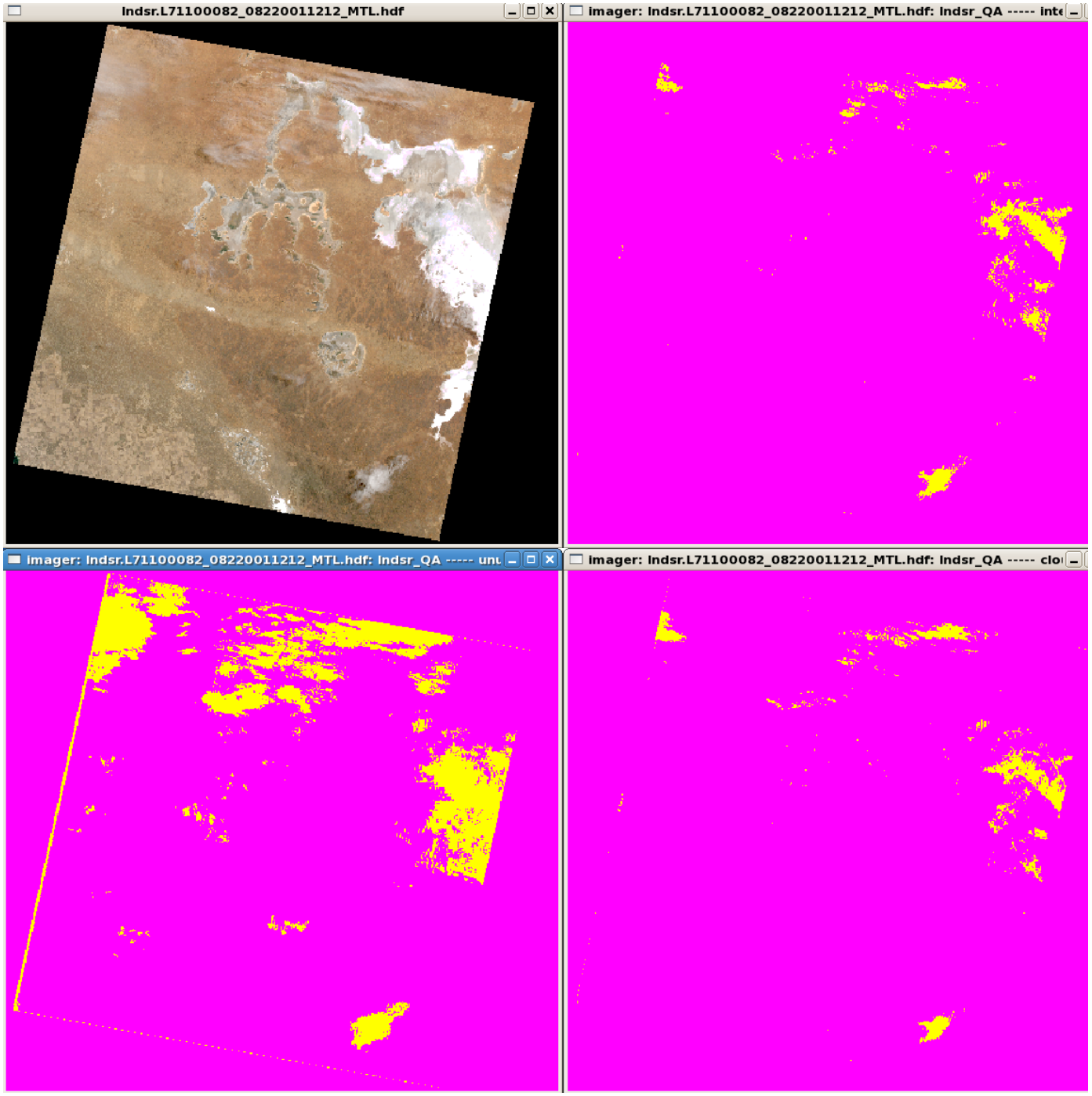
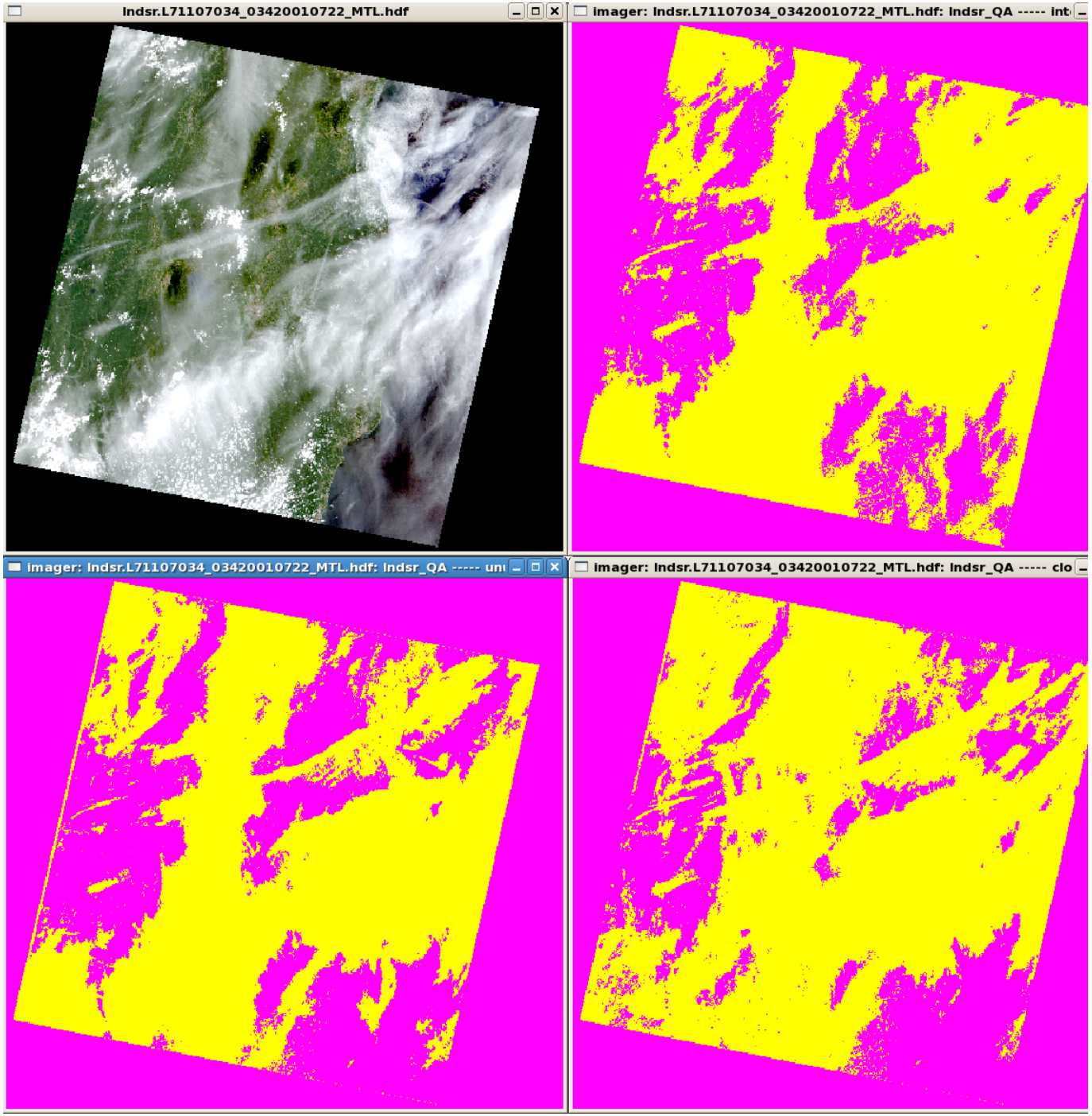
P79R18



P100R82

Leakage
10%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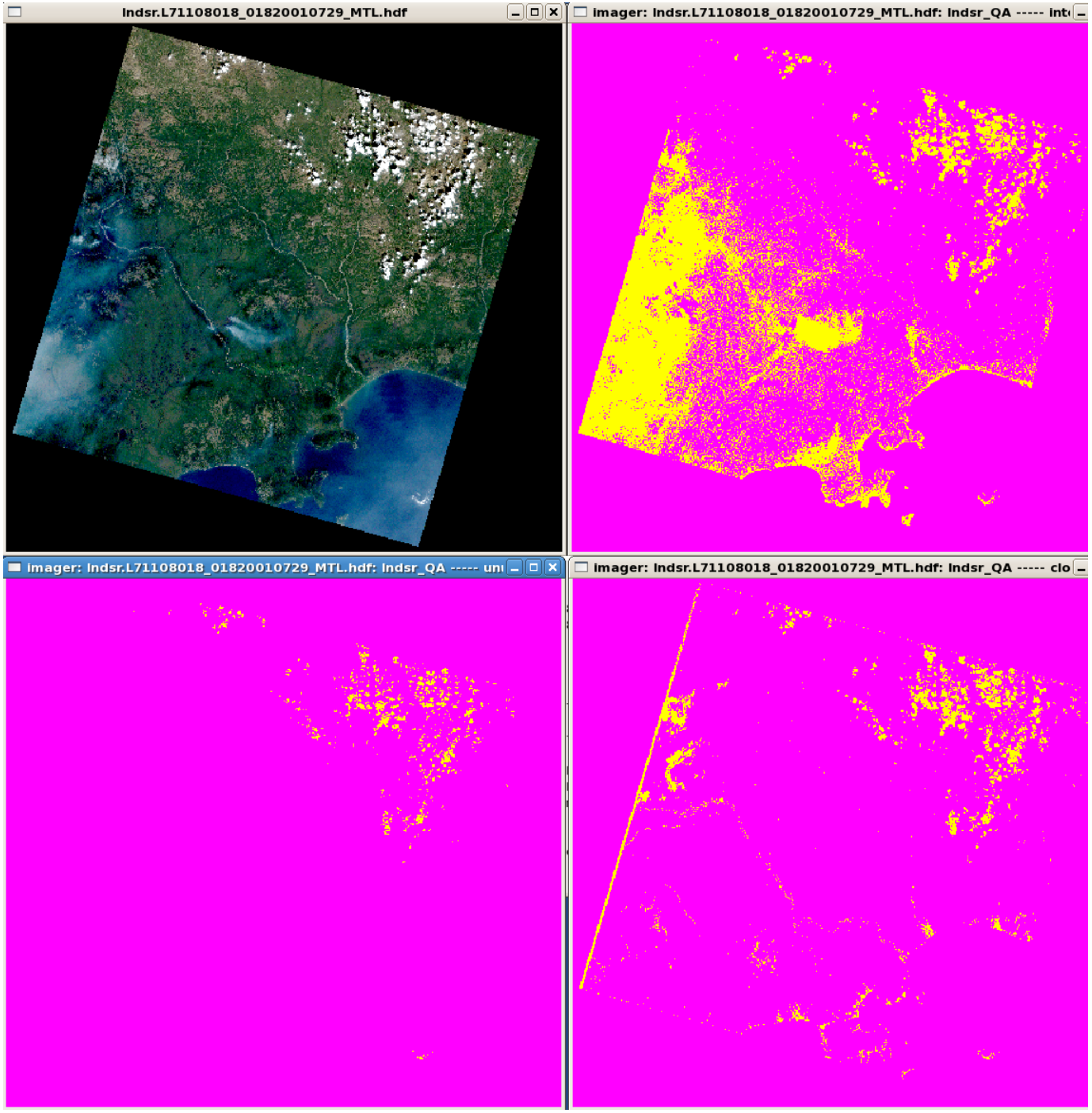
P107R34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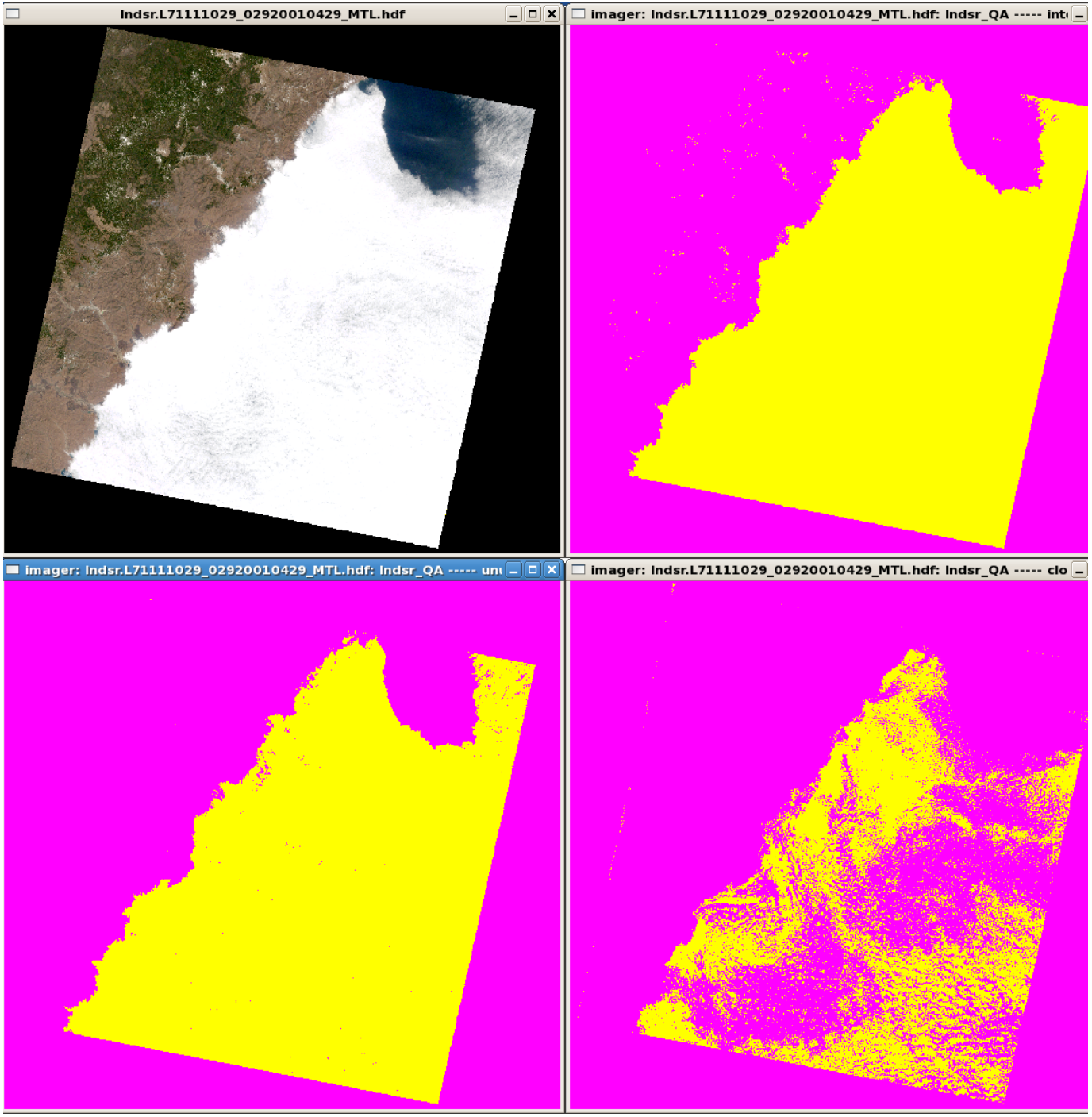
P108R18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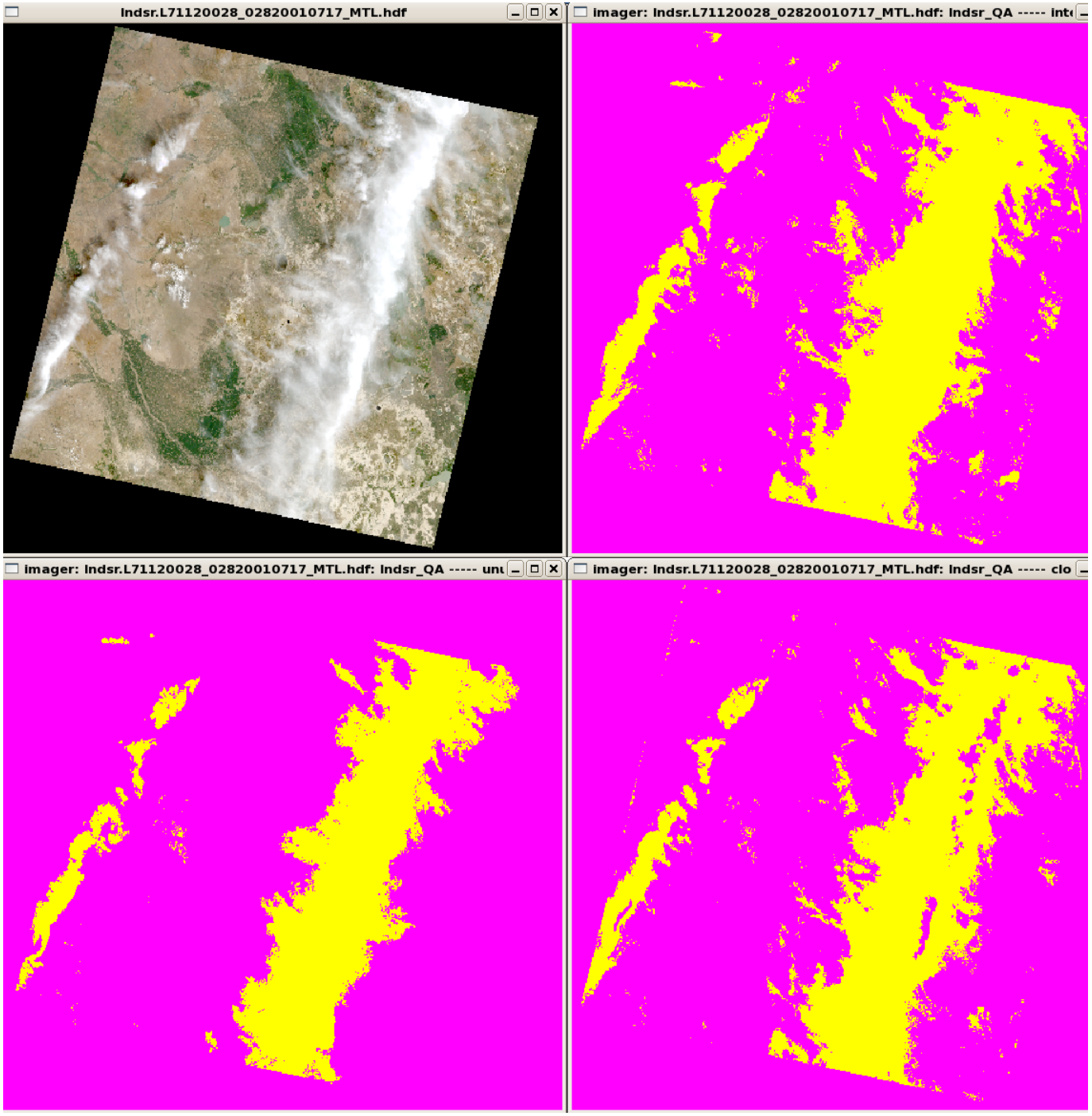
P111R29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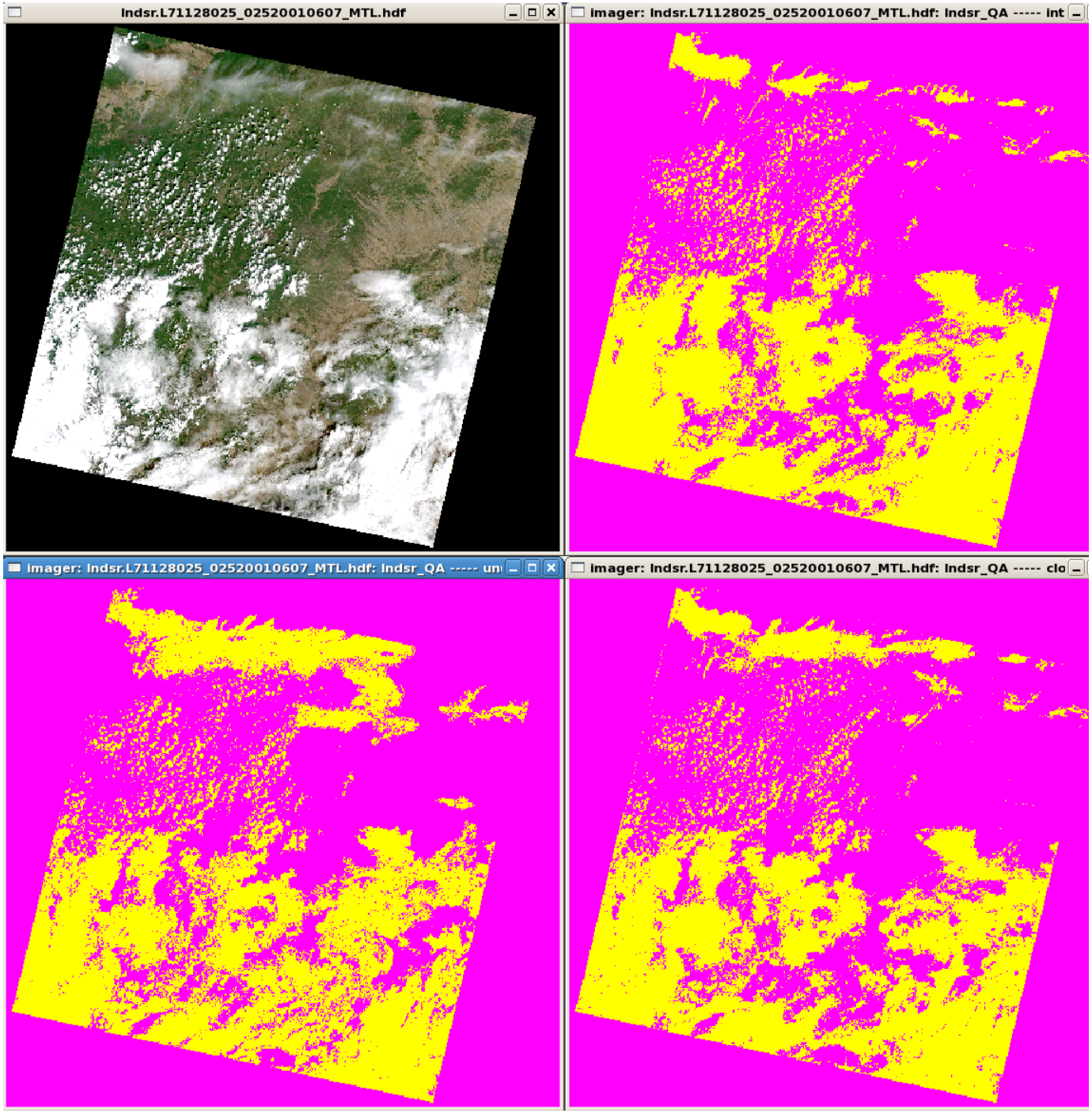
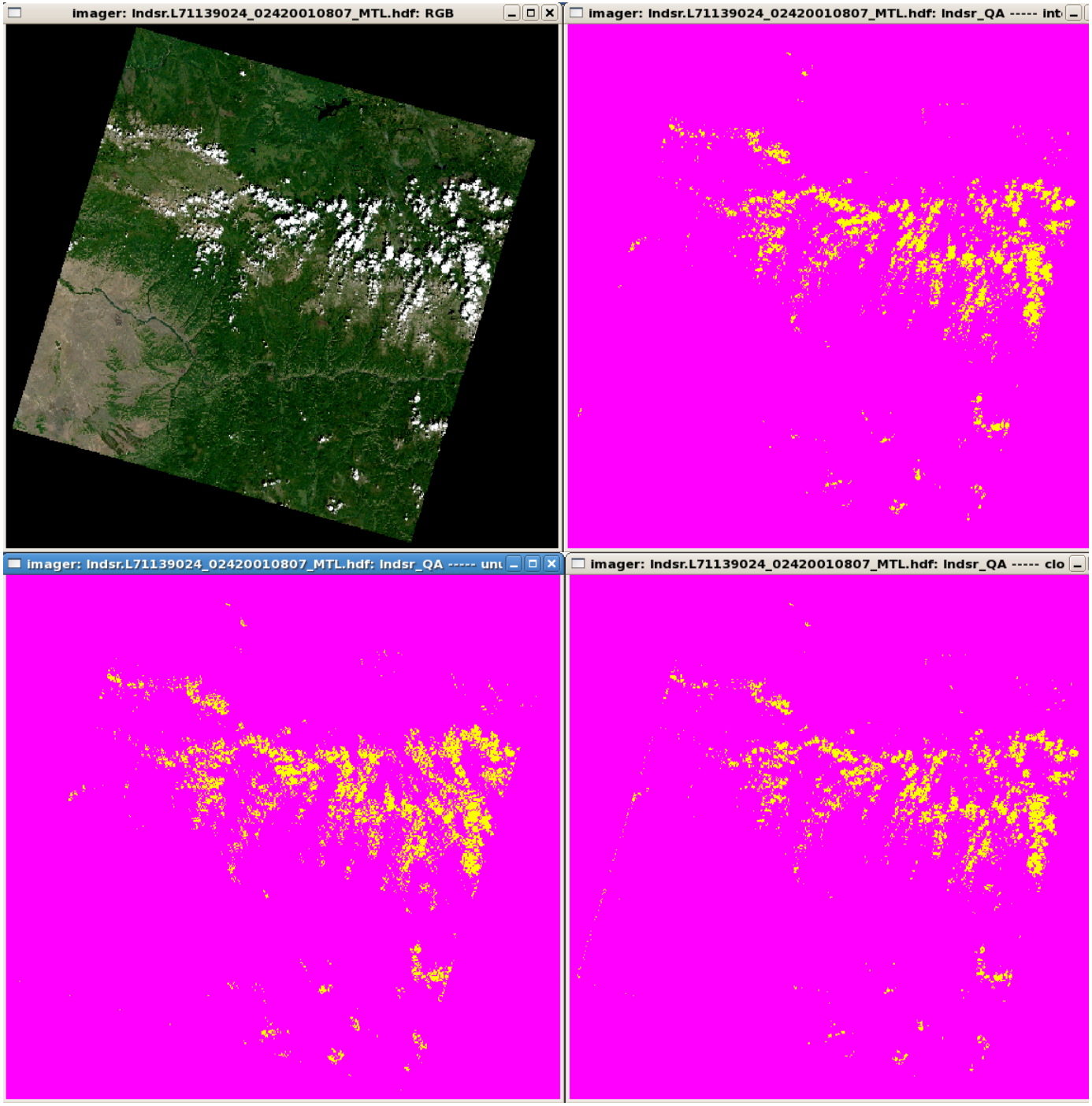
P120R28



P128R25

Leakage
10%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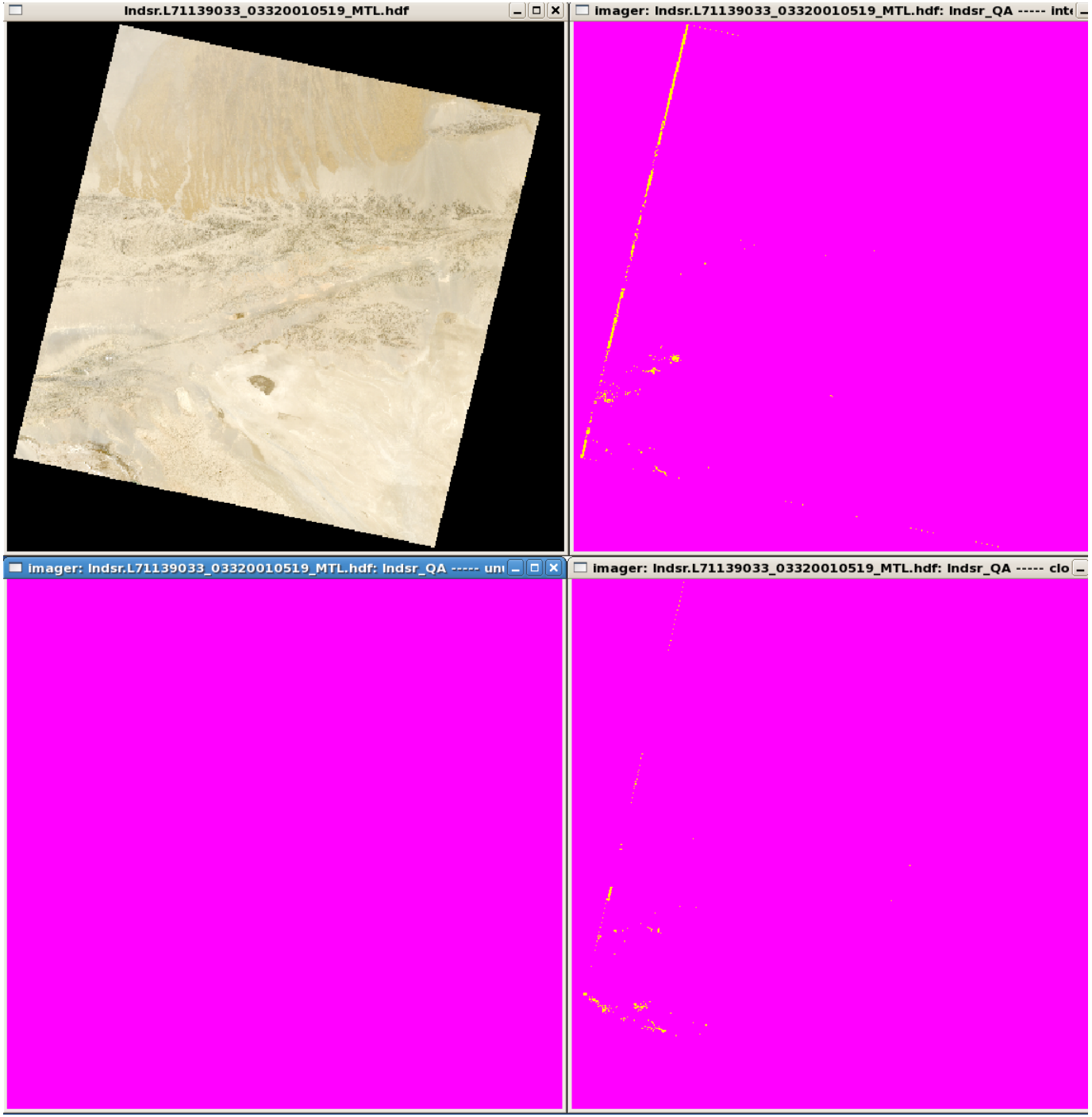
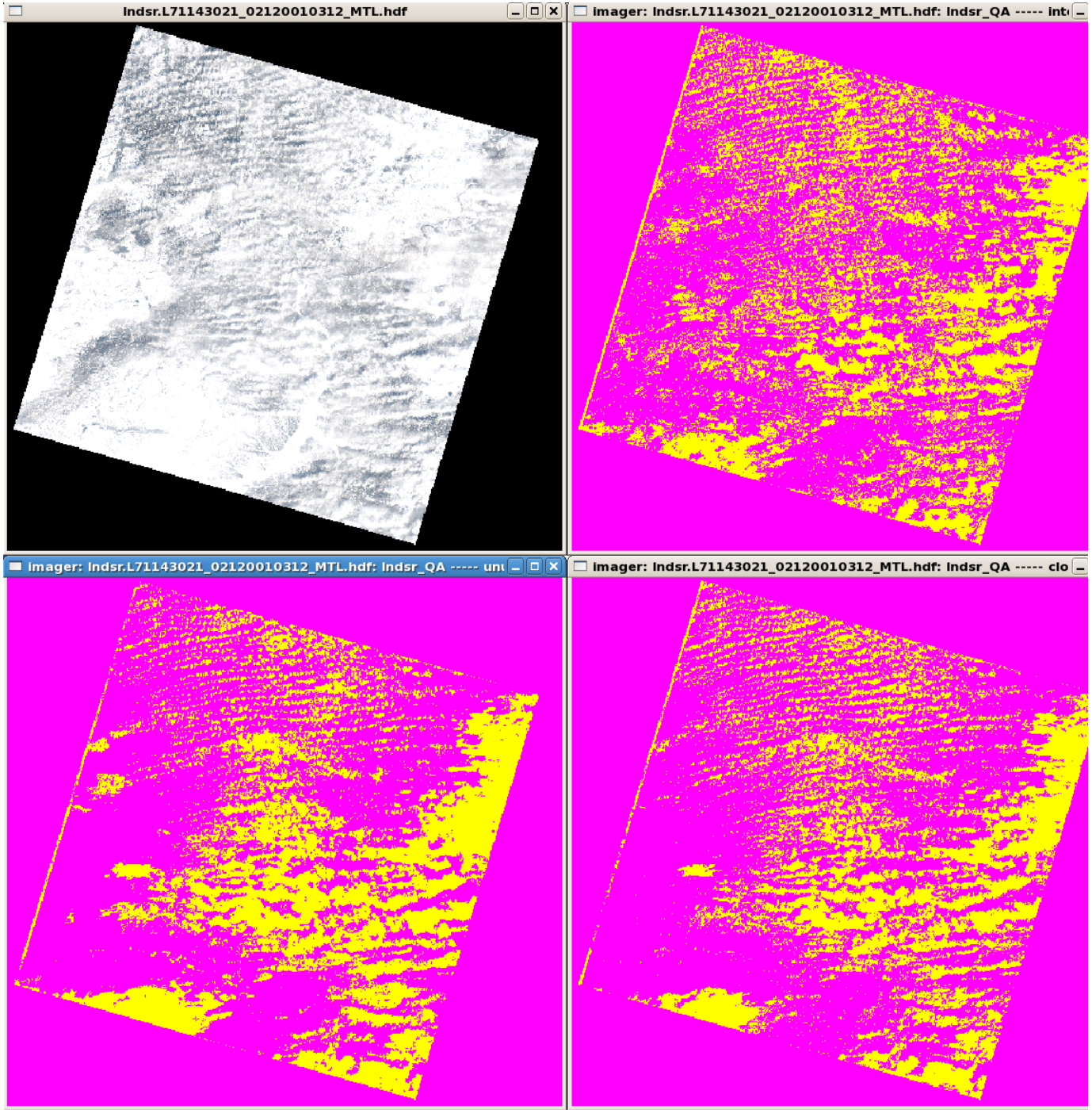
imager: lndsr.L71139024_02420010807_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71139024_02420010807_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71139024_02420010807_MTL.hdf: lndsr_QA ----- clo

P139R24

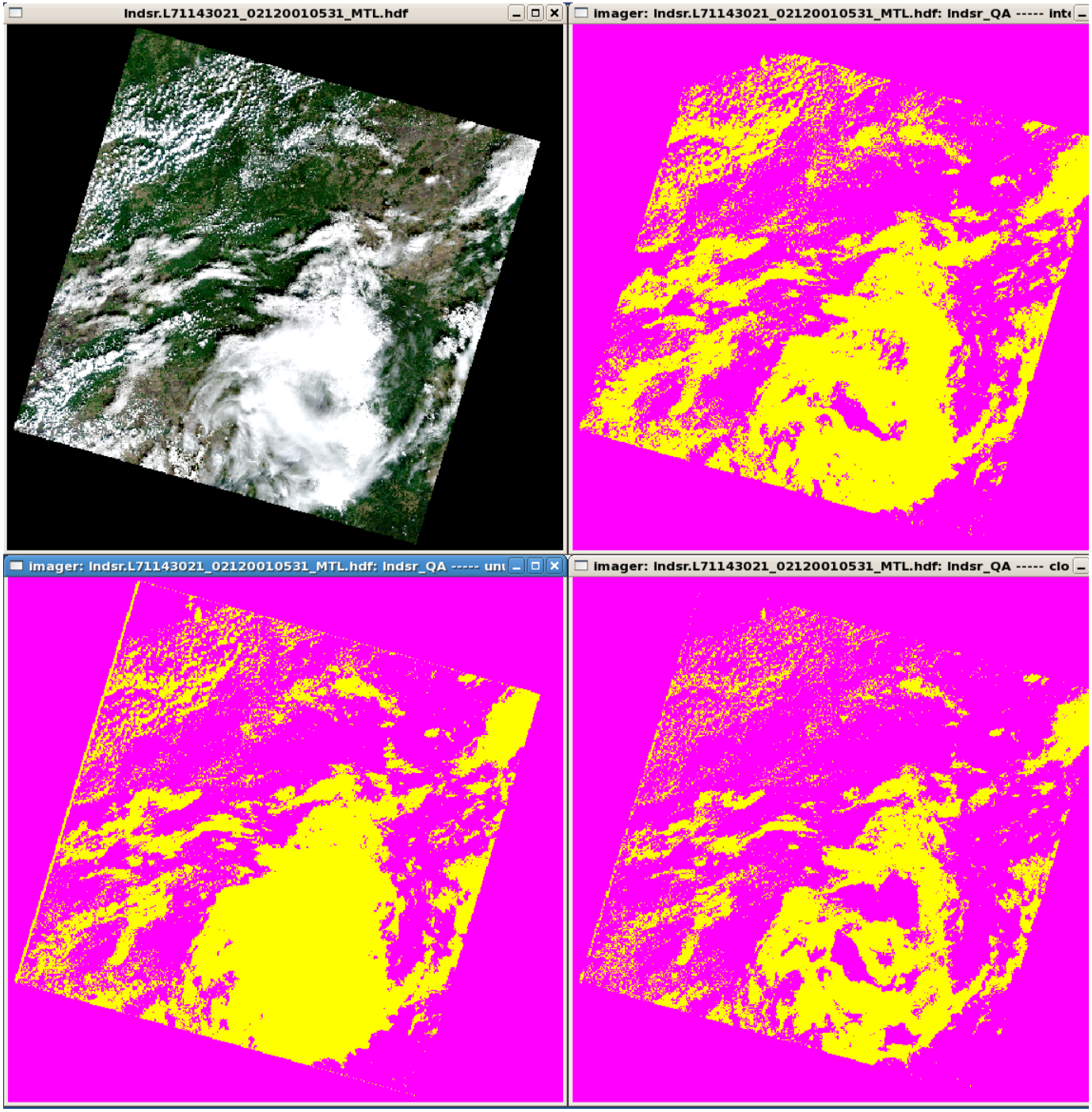

lndsr.L71139033_03320010519_MTL.hdf
imager: lndsr.L71139033_03320010519_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71139033_03320010519_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71139033_03320010519_MTL.hdf: lndsr_QA ----- clo

P139R33

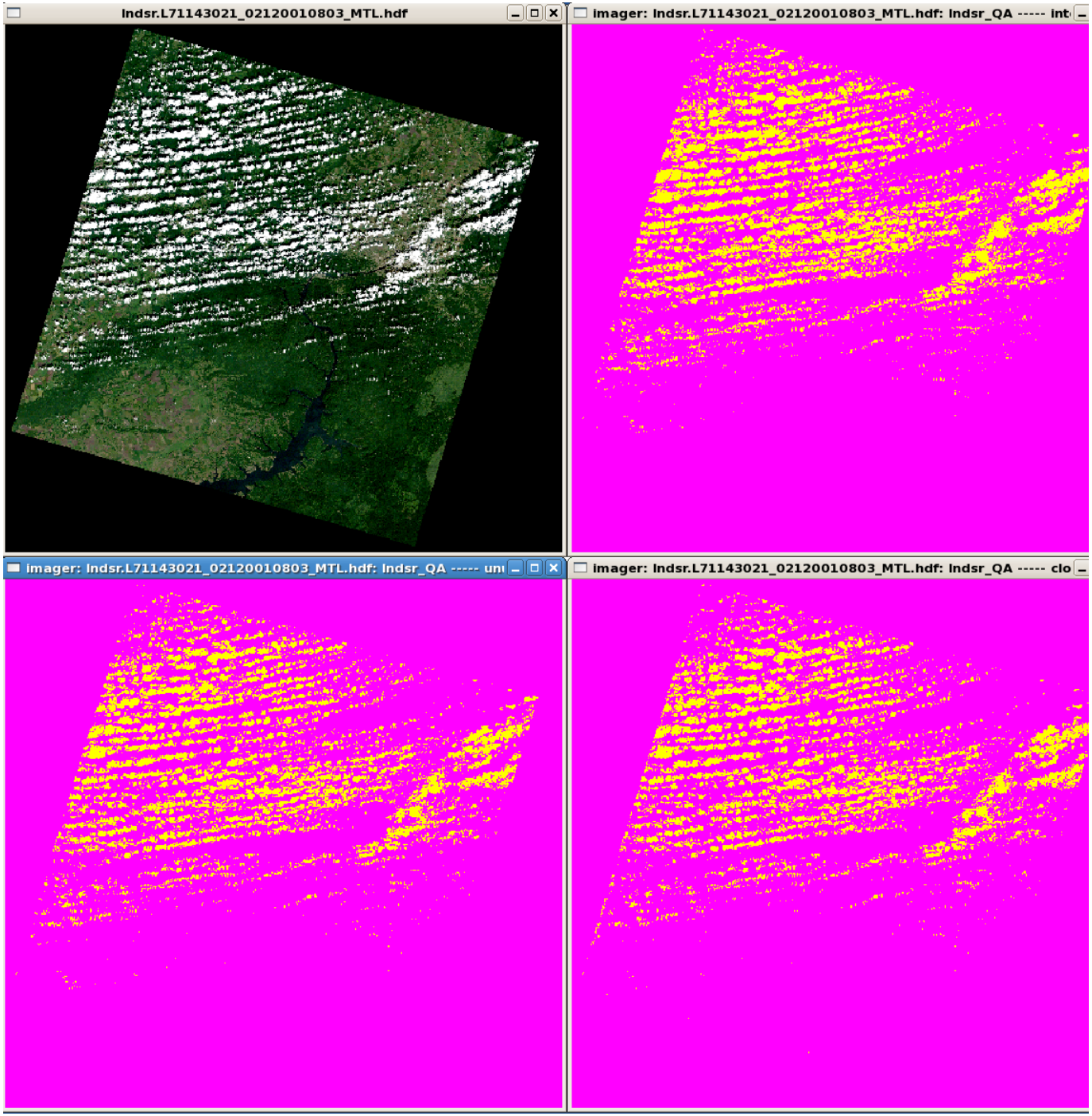


P143R21 (1)

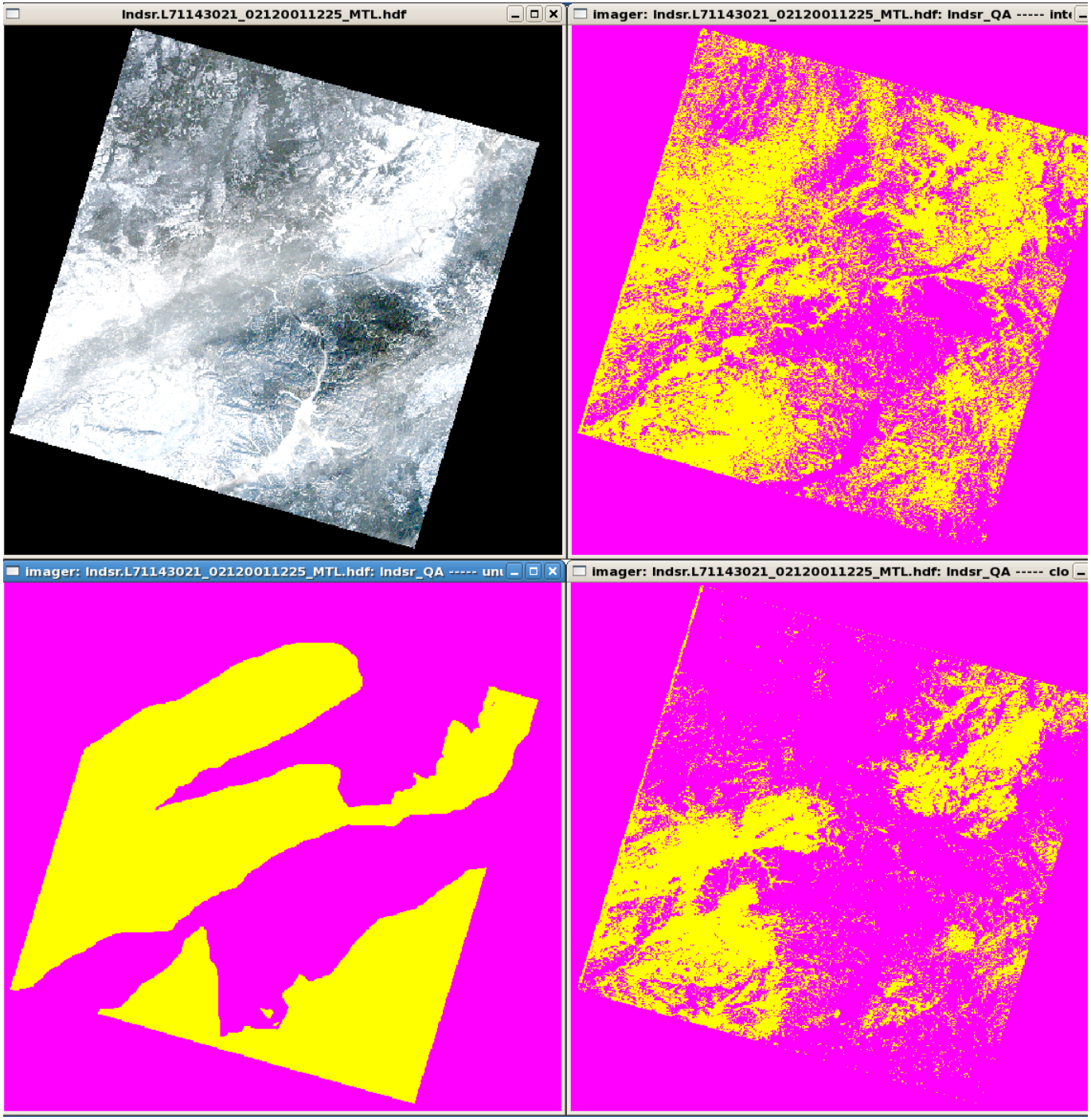
Leakage
10%


lndsr.L71143021_02120010531_MTL.hdf
imager: lndsr.L71143021_02120010531_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71143021_02120010531_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71143021_02120010531_MTL.hdf: lndsr_QA ----- clo

P143R21
(2)

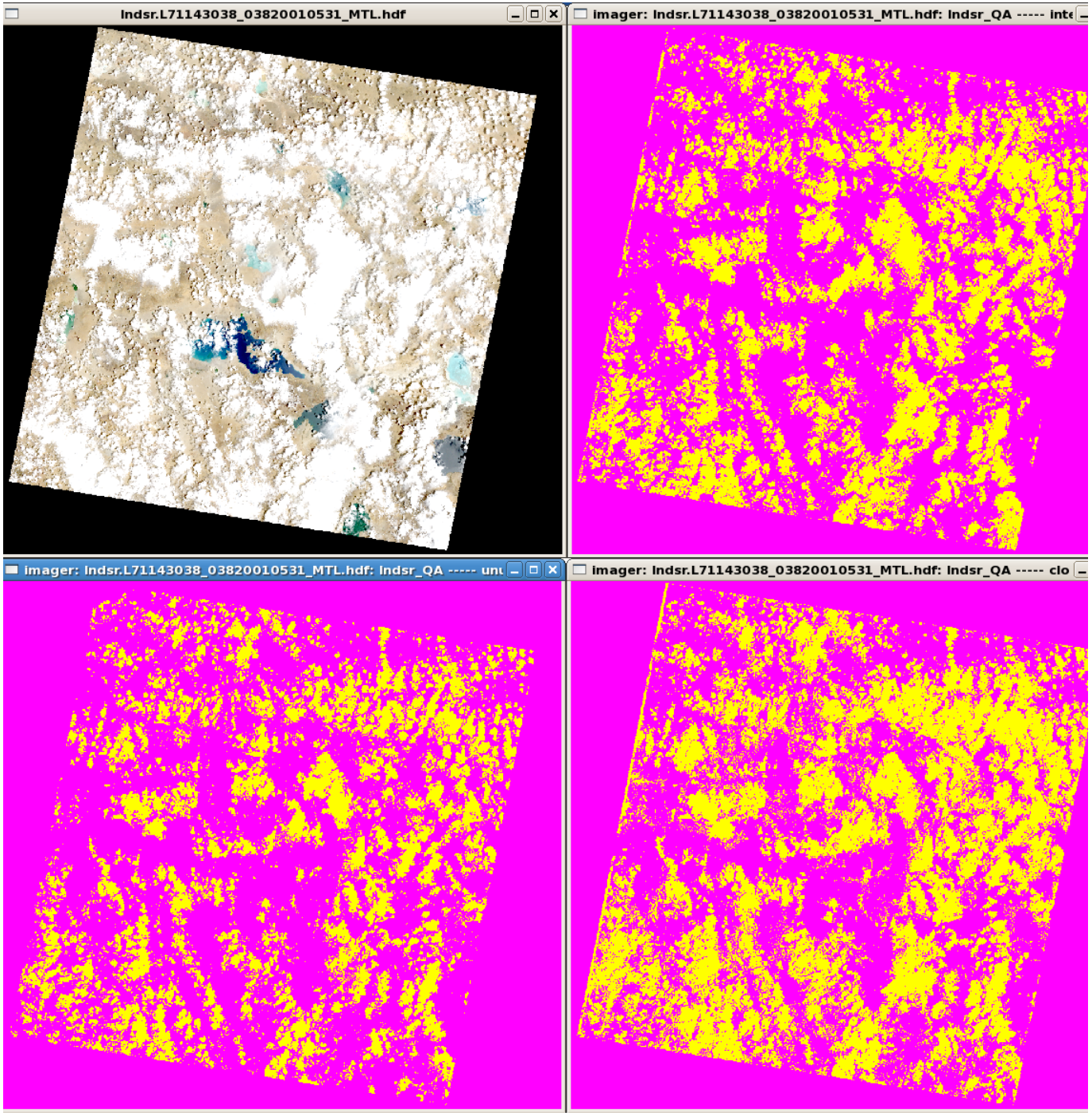

lndsr.L71143021_02120010803_MTL.hdf
imager: lndsr.L71143021_02120010803_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71143021_02120010803_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71143021_02120010803_MTL.hdf: lndsr_QA ----- clo

P143R21
(3)

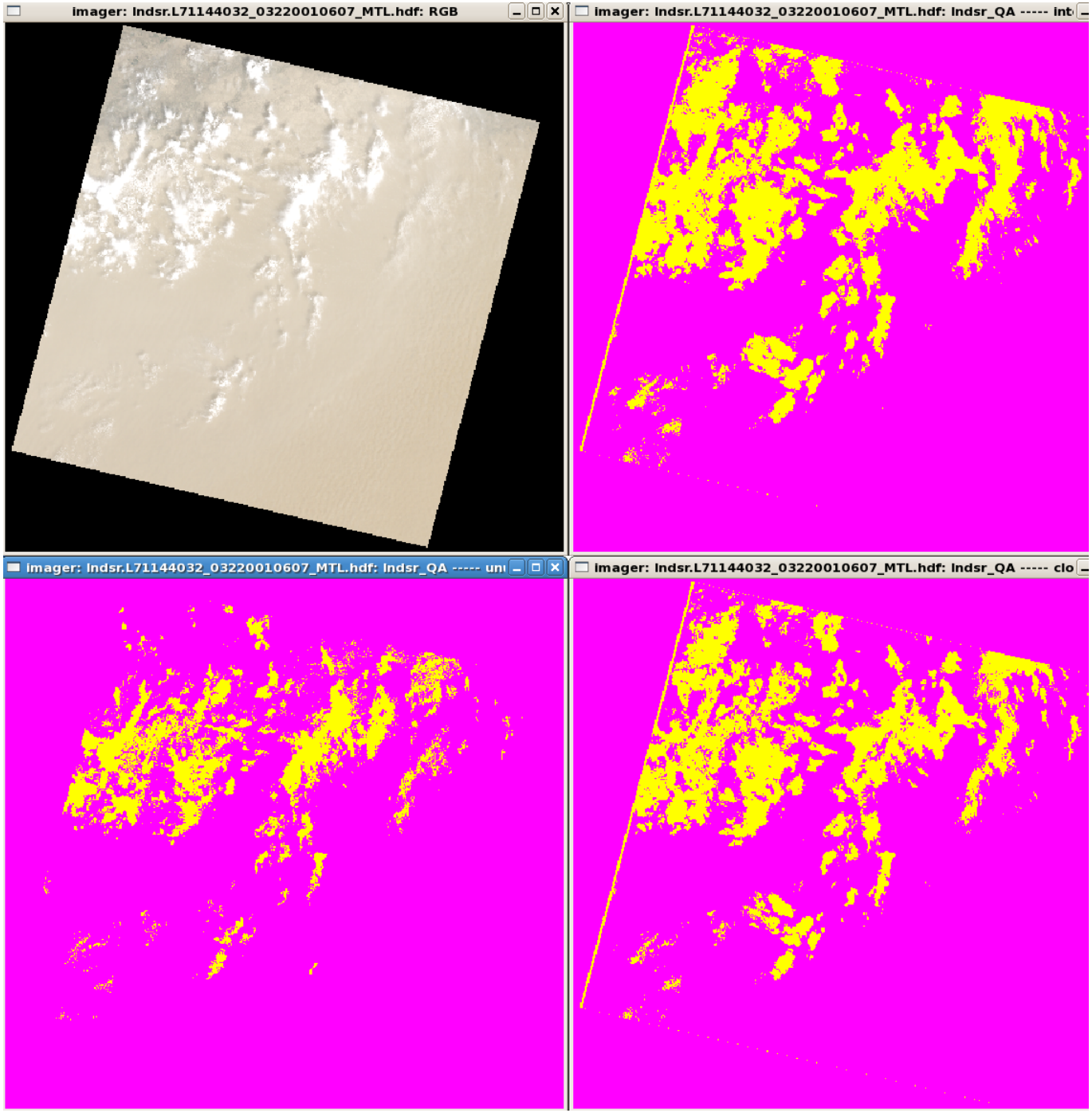


P143R21 (4)

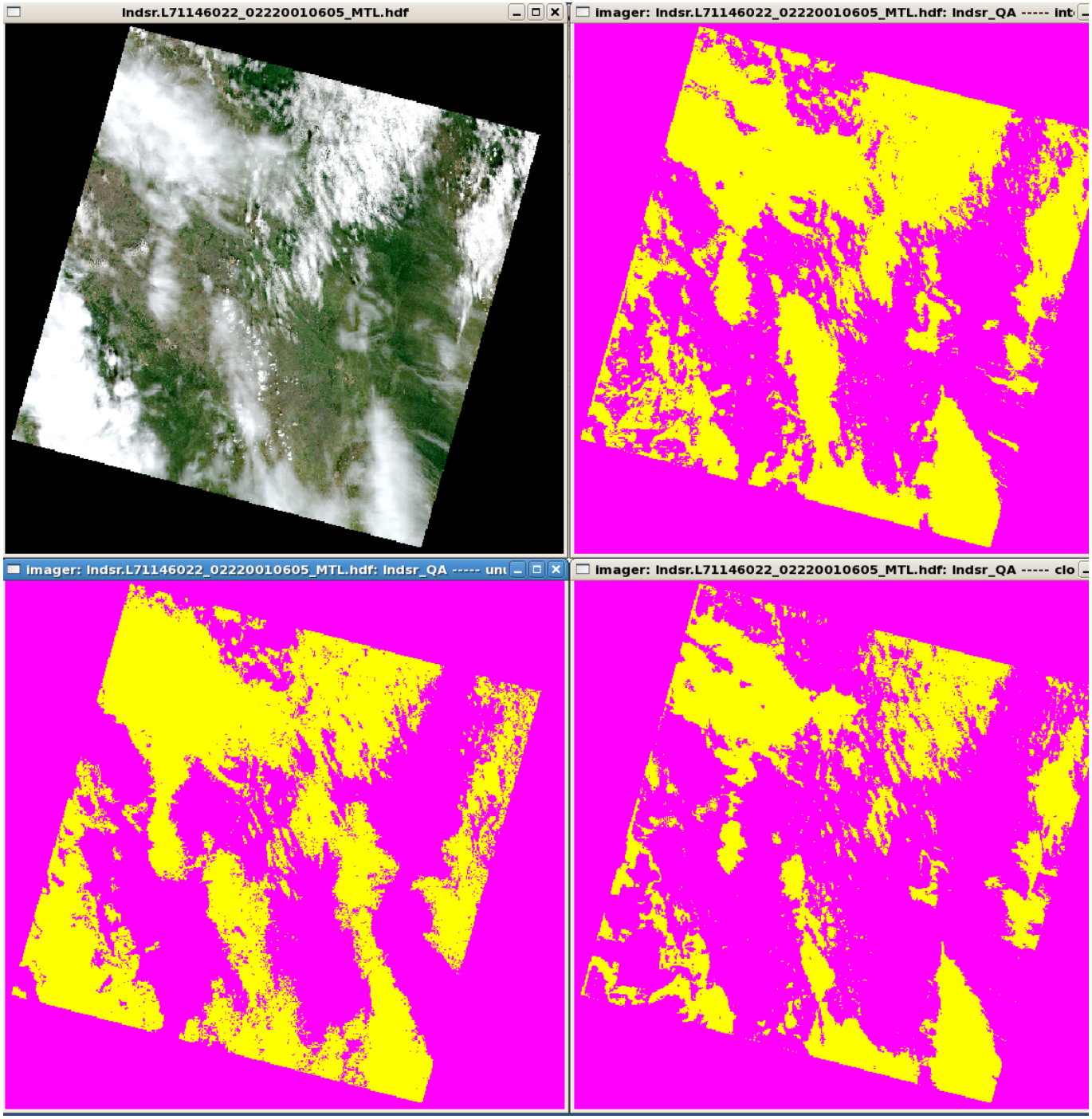
Leakage
22%


lndsr.L71143038_03820010531_MTL.hdf
imager: lndsr.L71143038_03820010531_MTL.hdf: lndsr_QA ----- inte
imager: lndsr.L71143038_03820010531_MTL.hdf: lndsr_QA ----- unc
imager: lndsr.L71143038_03820010531_MTL.hdf: lndsr_QA ----- clo

P143R38

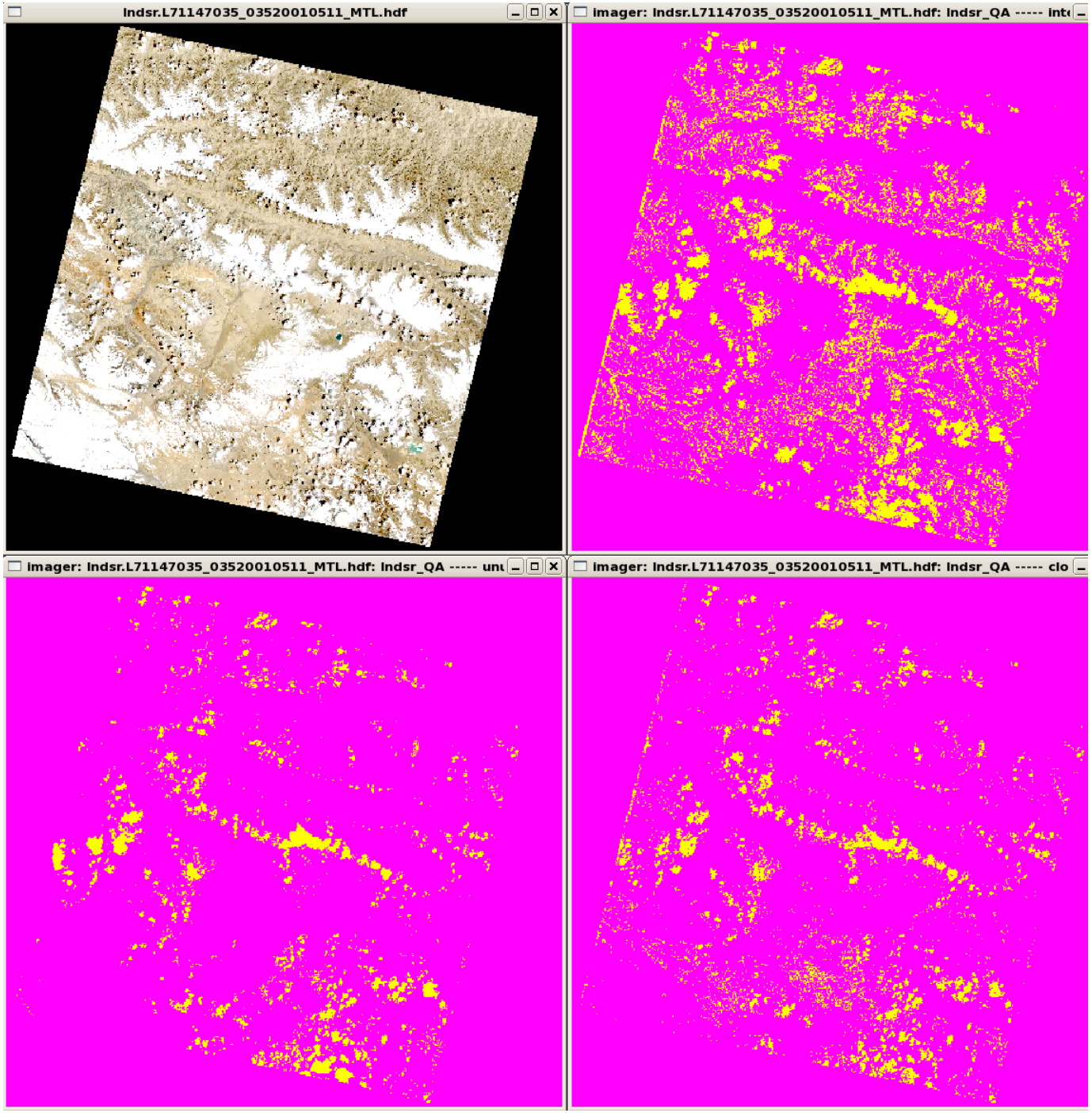

imager: lndsr.L71144032_03220010607_MTL.hdf: RGB
imager: lndsr.L71144032_03220010607_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71144032_03220010607_MTL.hdf: lndsr_QA ----- unl
imager: lndsr.L71144032_03220010607_MTL.hdf: lndsr_QA ----- clo

P144R32

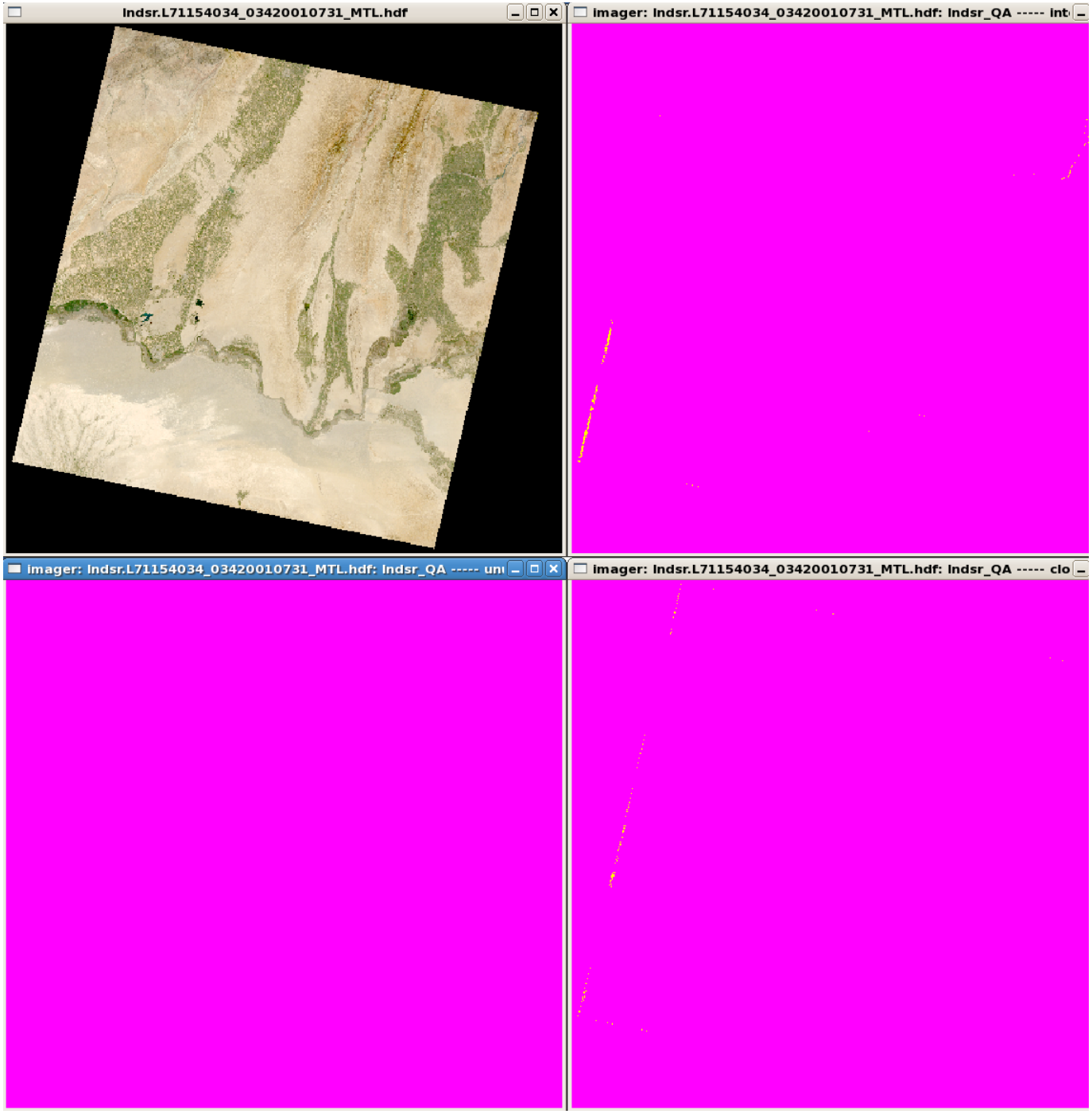


P146R22

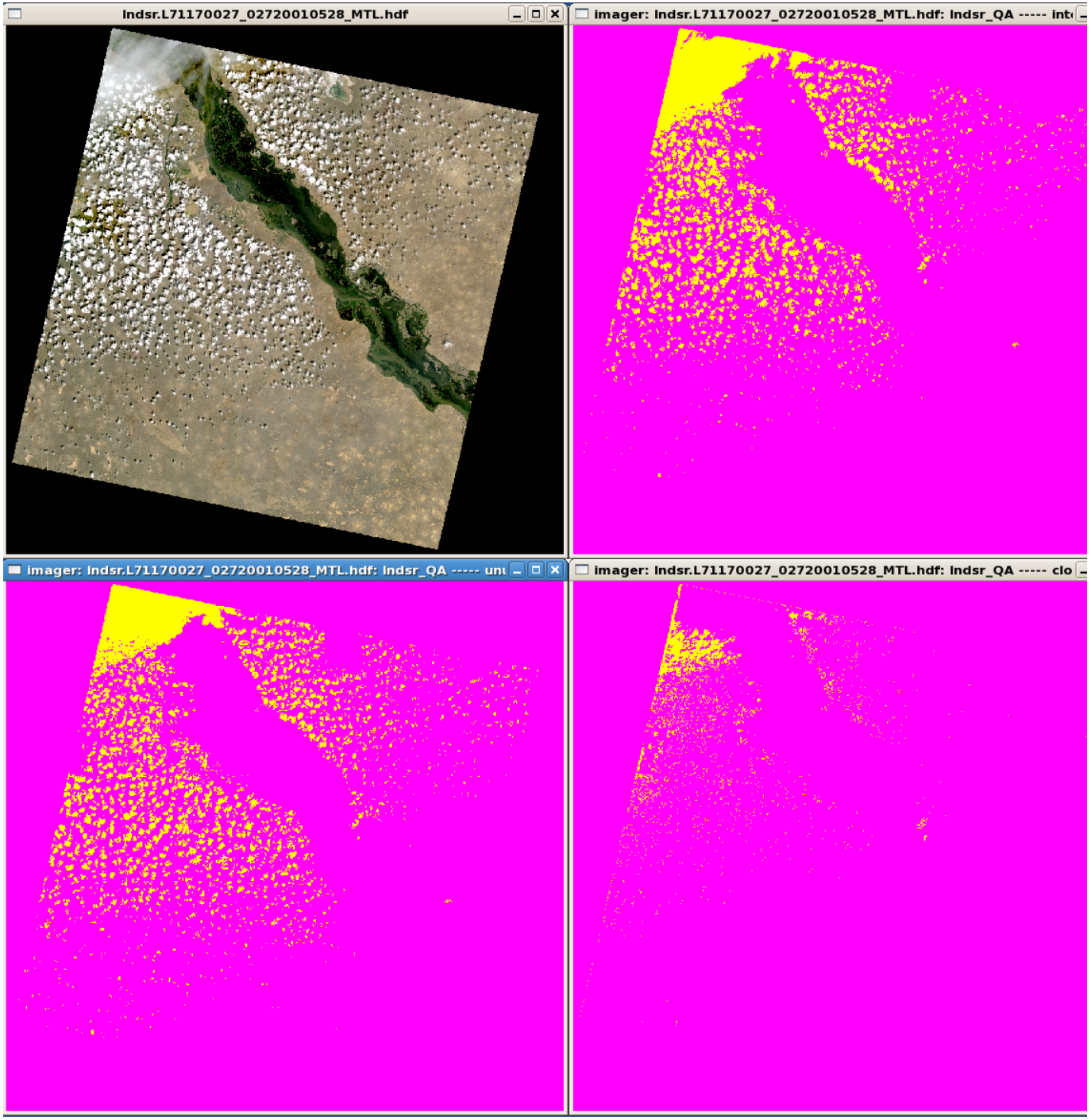
Leakage
9%


lndsr.L71147035_03520010511_MTL.hdf
imager: lndsr.L71147035_03520010511_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71147035_03520010511_MTL.hdf: lndsr_QA ----- unl
imager: lndsr.L71147035_03520010511_MTL.hdf: lndsr_QA ----- clo

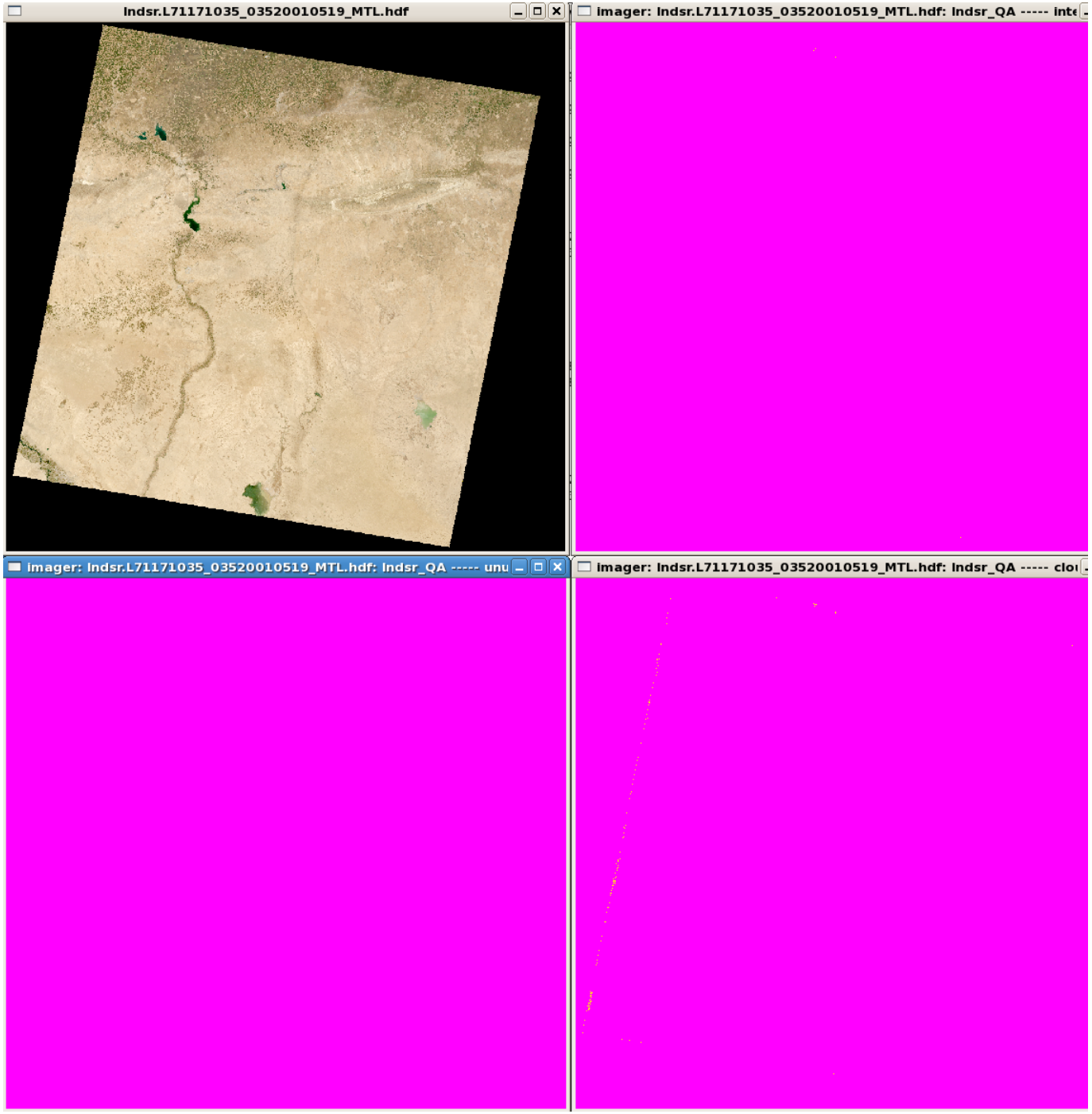
P147R35


lndsr.L71154034_03420010731_MTL.hdf
imager: lndsr.L71154034_03420010731_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71154034_03420010731_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71154034_03420010731_MTL.hdf: lndsr_QA ----- clo

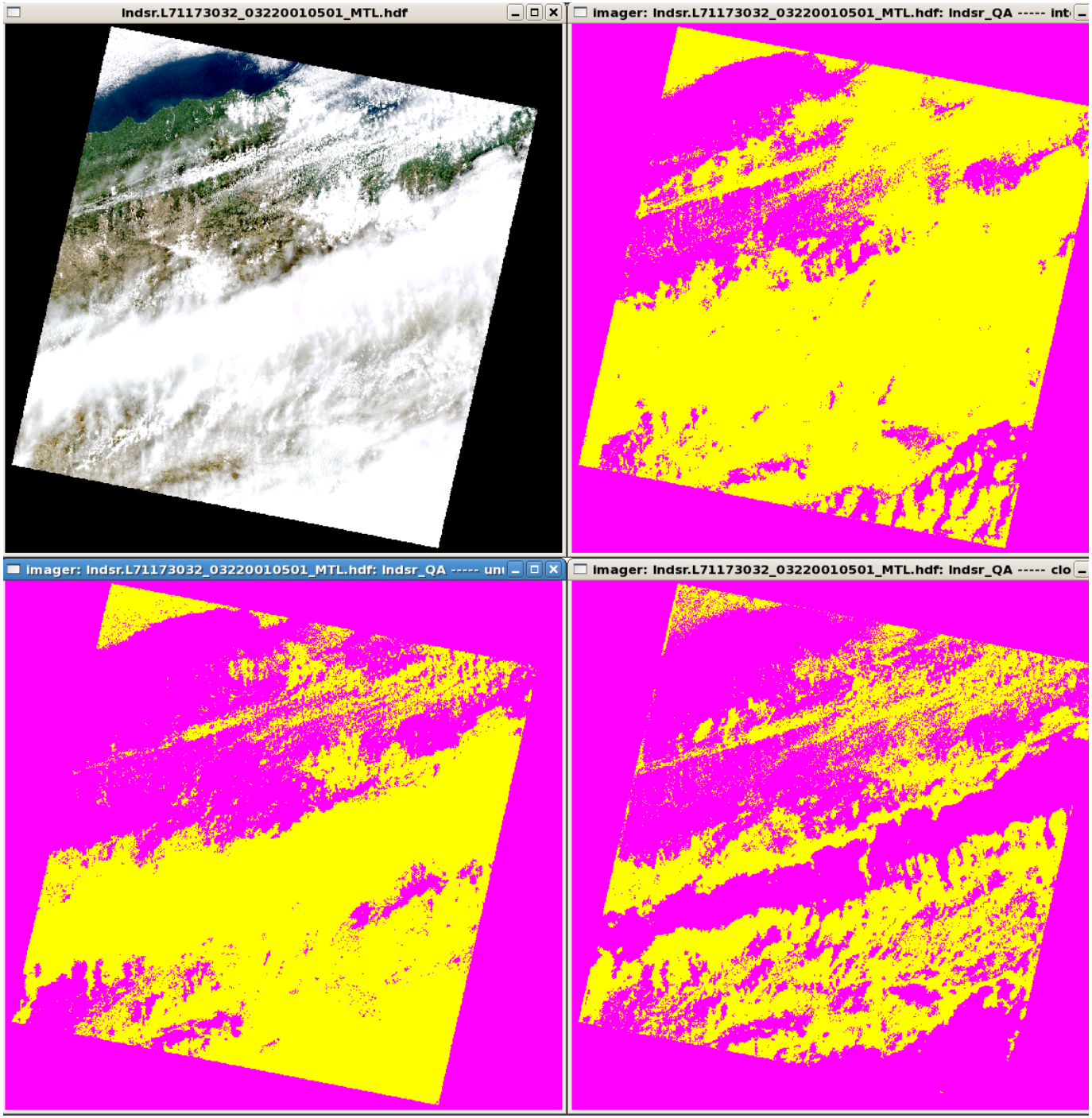
P154R34


lndsr.L71170027_02720010528_MTL.hdf
imager: lndsr.L71170027_02720010528_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71170027_02720010528_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71170027_02720010528_MTL.hdf: lndsr_QA ----- clo

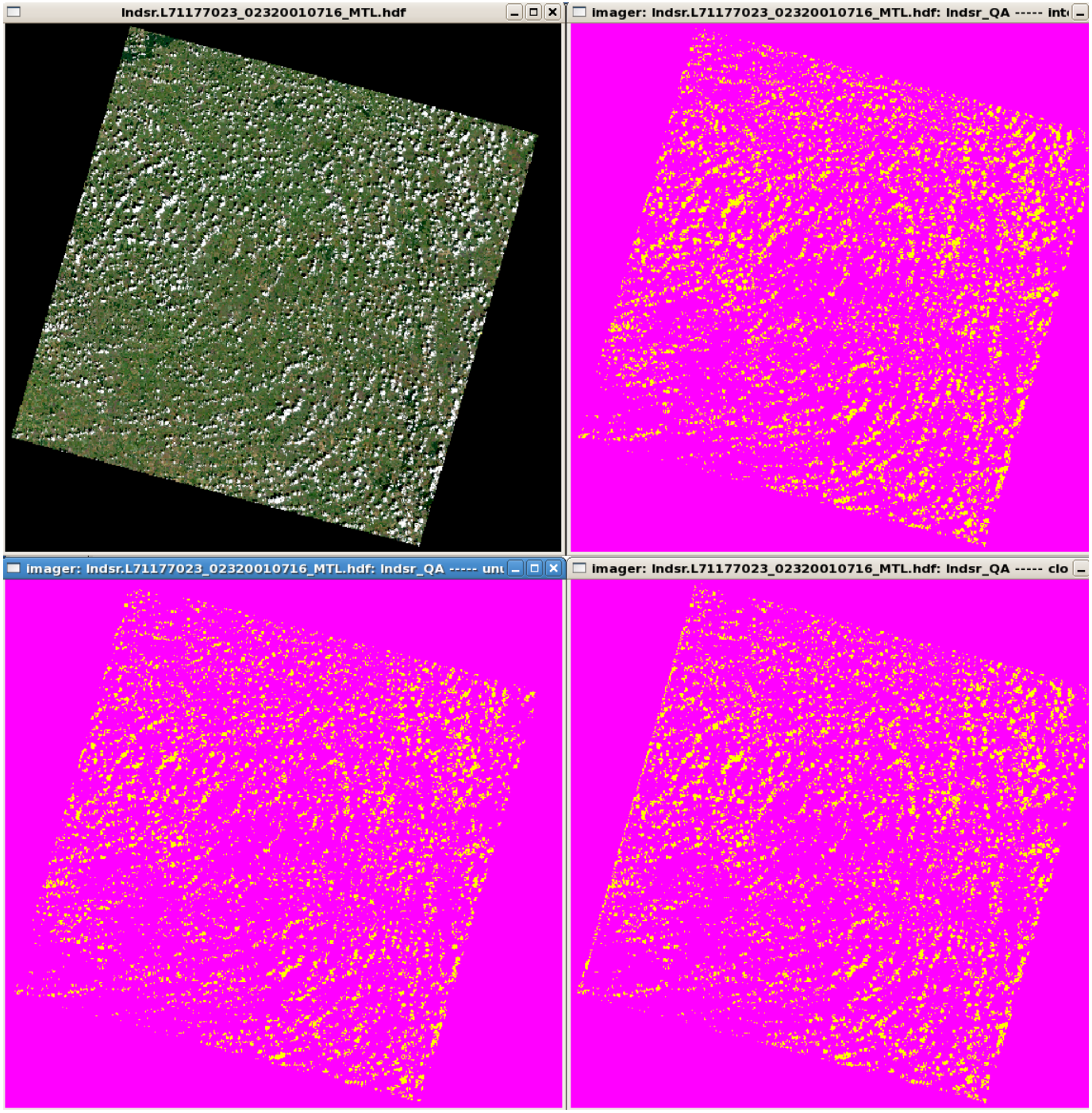
P170R27


lndsr.L71171035_03520010519_MTL.hdf
imager: lndsr.L71171035_03520010519_MTL.hdf: lndsr_QA ----- inte
imager: lndsr.L71171035_03520010519_MTL.hdf: lndsr_QA ----- unu
imager: lndsr.L71171035_03520010519_MTL.hdf: lndsr_QA ----- clo

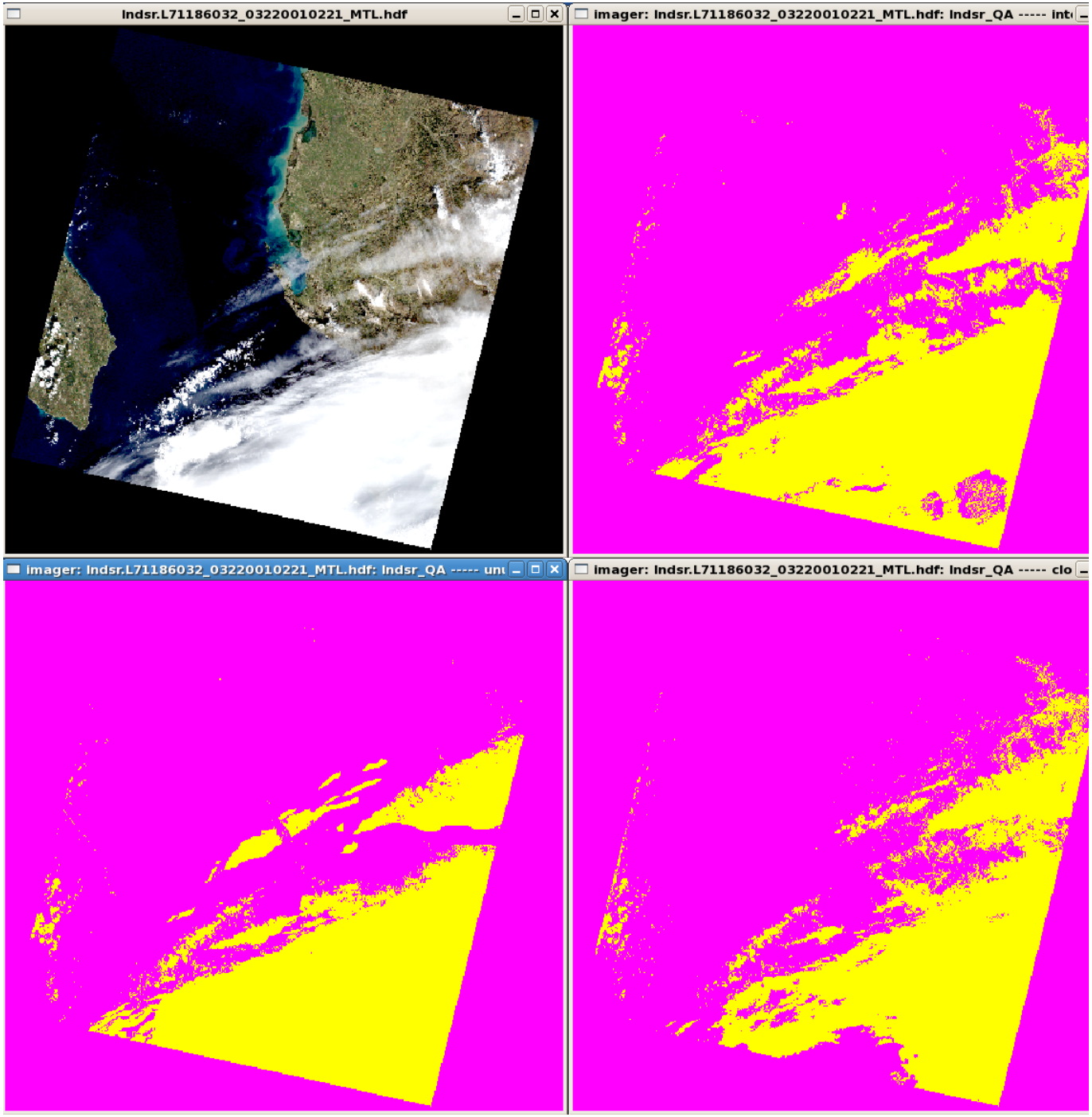
P171R35


lndsr.L71173032_03220010501_MTL.hdf
imager: lndsr.L71173032_03220010501_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71173032_03220010501_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71173032_03220010501_MTL.hdf: lndsr_QA ----- clo

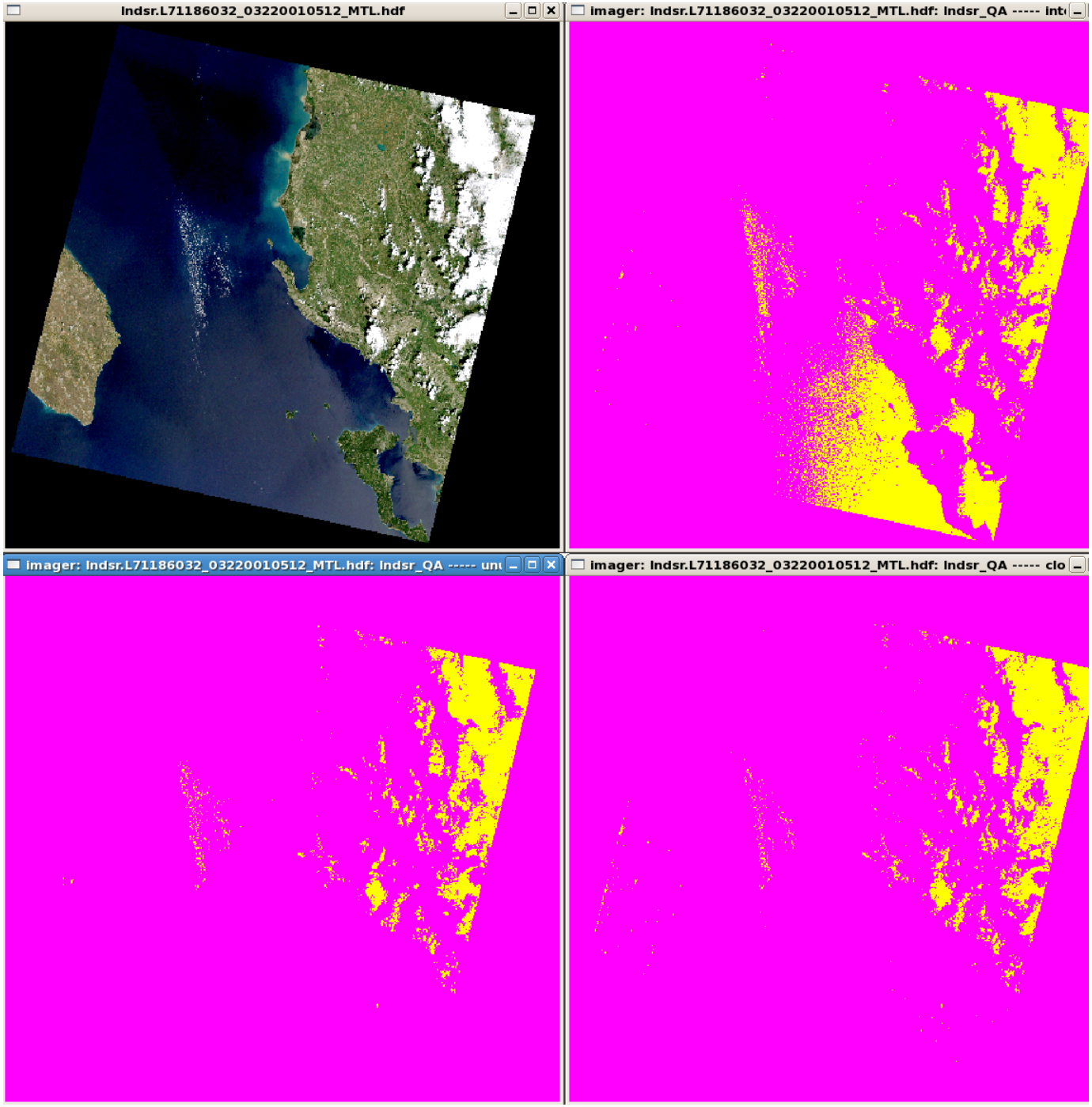
P173R32


lndsr.L71177023_02320010716_MTL.hdf
imager: lndsr.L71177023_02320010716_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71177023_02320010716_MTL.hdf: lndsr_QA ----- unc
imager: lndsr.L71177023_02320010716_MTL.hdf: lndsr_QA ----- clo

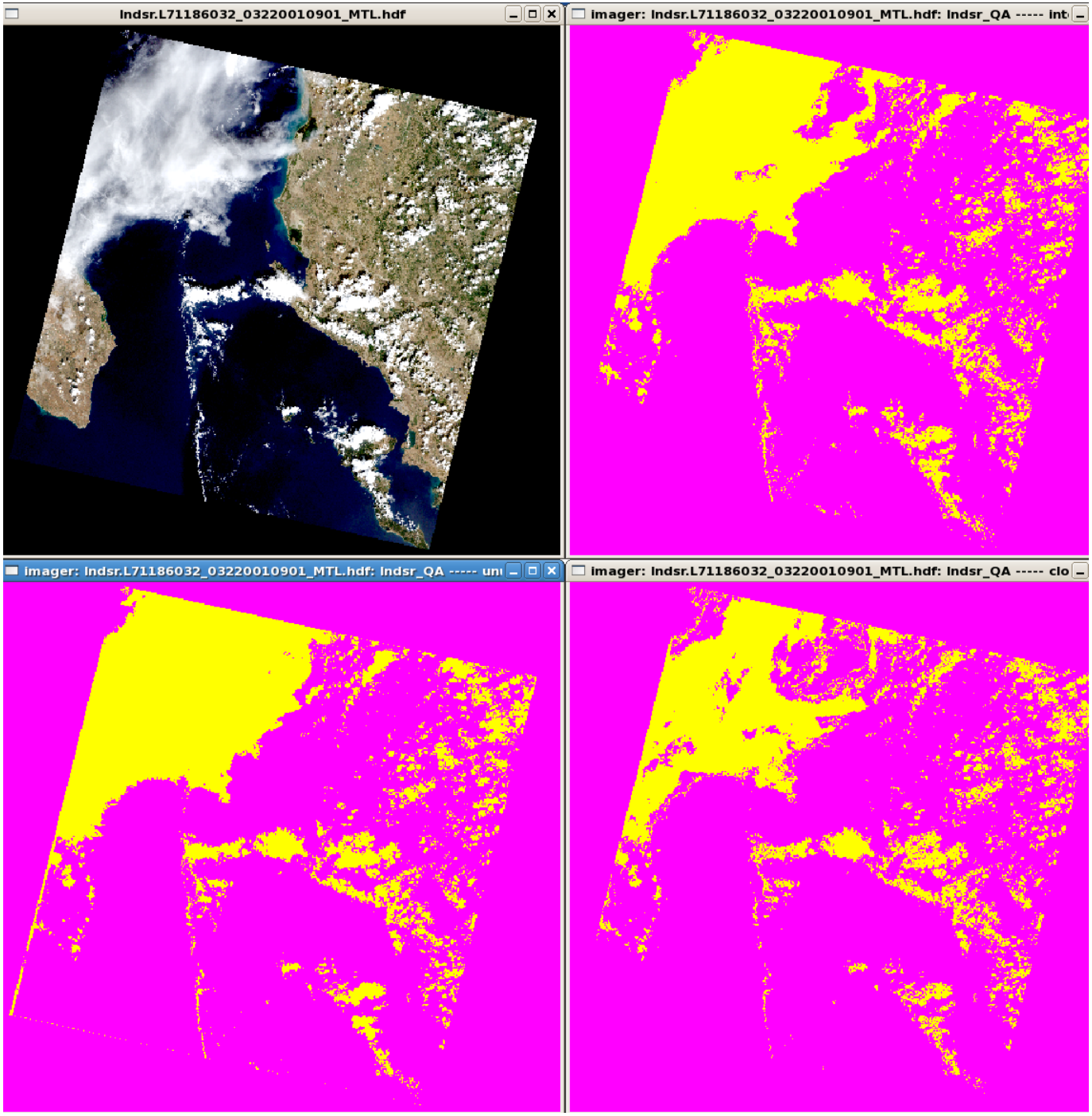
P177R23


lndsr.L71186032_03220010221_MTL.hdf
imager: lndsr.L71186032_03220010221_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71186032_03220010221_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71186032_03220010221_MTL.hdf: lndsr_QA ----- clo

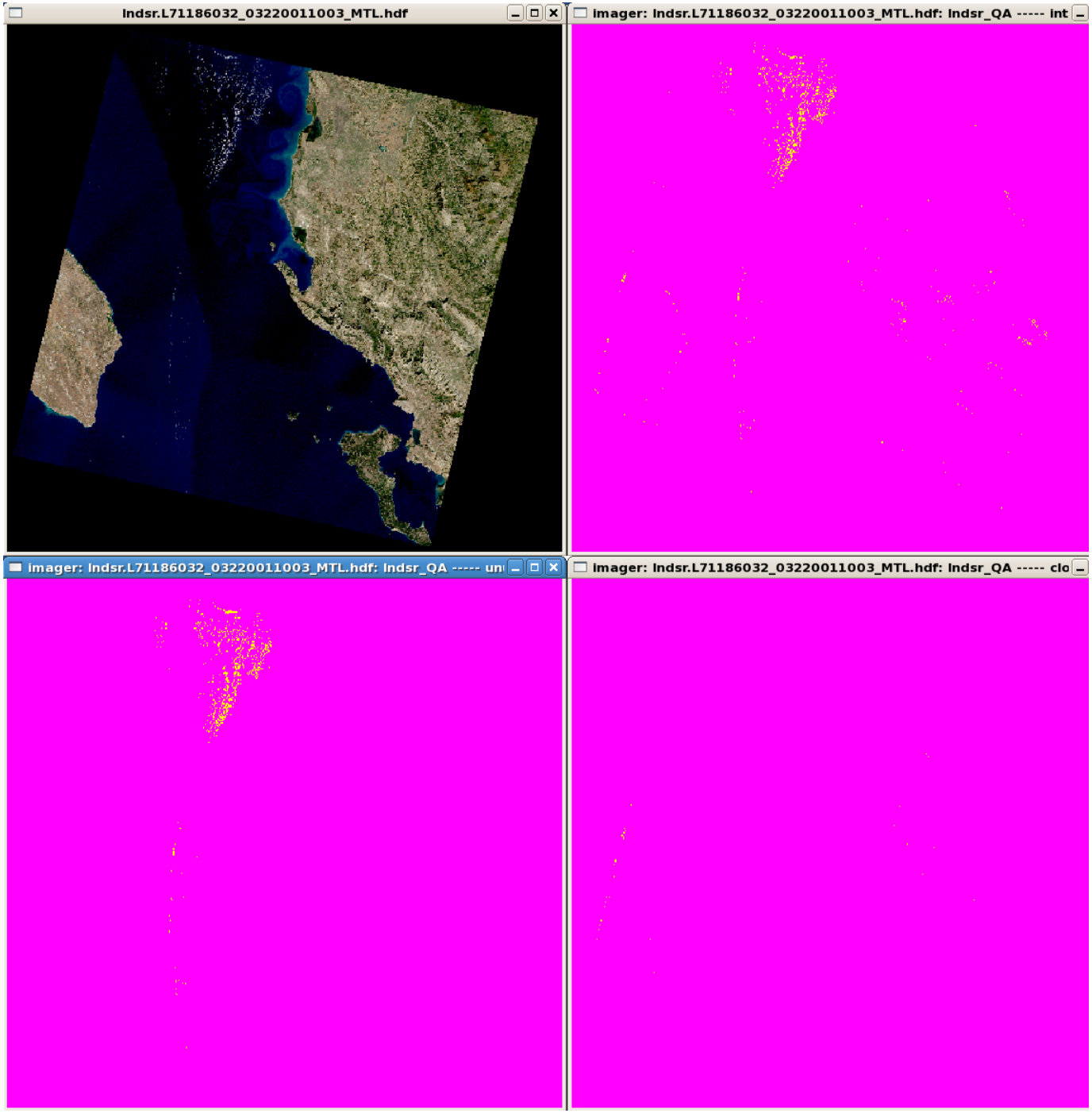
P186R32
(1)


lndsr.L71186032_03220010512_MTL.hdf
imager: lndsr.L71186032_03220010512_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71186032_03220010512_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71186032_03220010512_MTL.hdf: lndsr_QA ----- clo

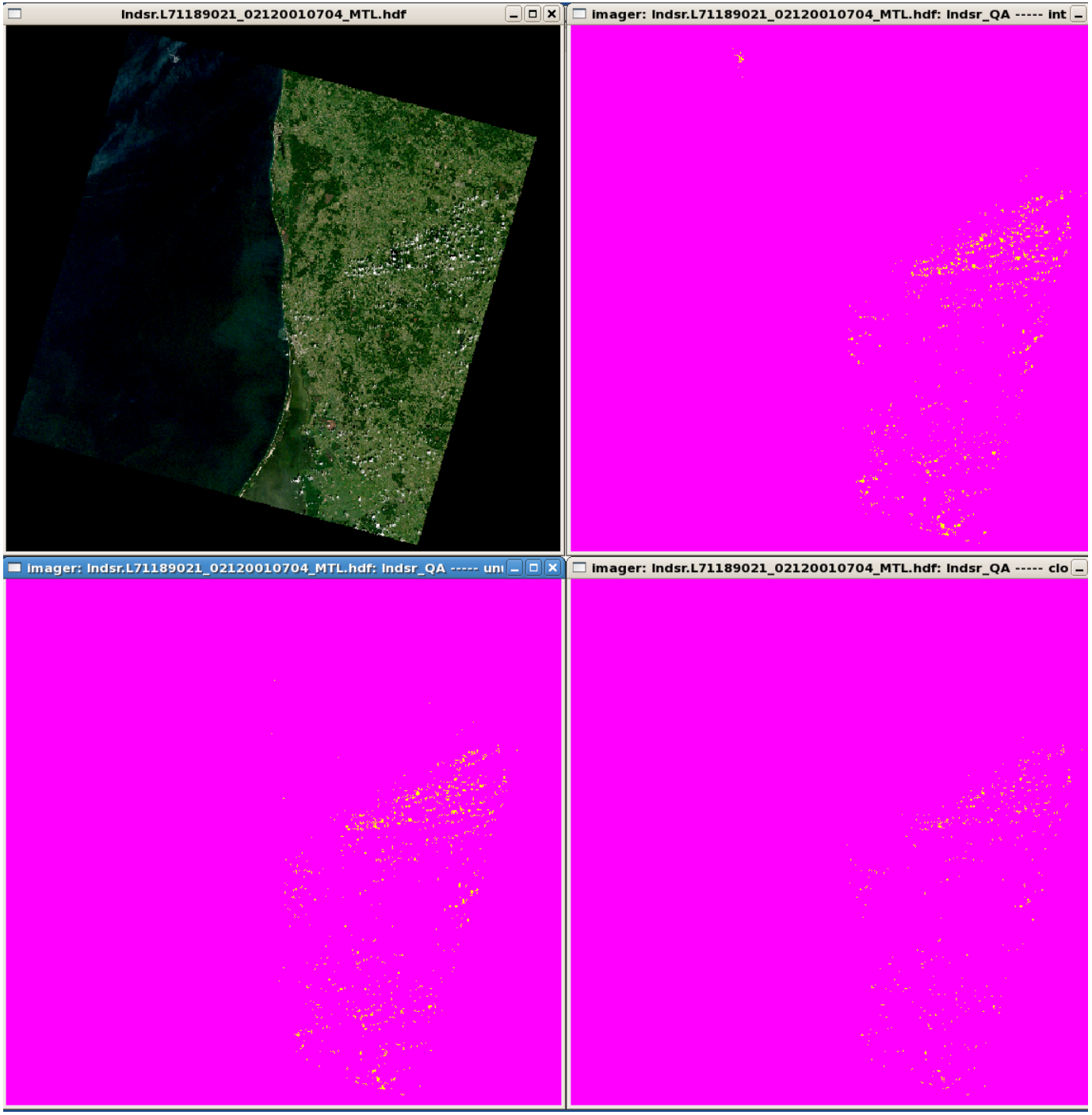
P186R32
(2)


lndsr.L71186032_03220010901_MTL.hdf
imager: lndsr.L71186032_03220010901_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71186032_03220010901_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71186032_03220010901_MTL.hdf: lndsr_QA ----- clo

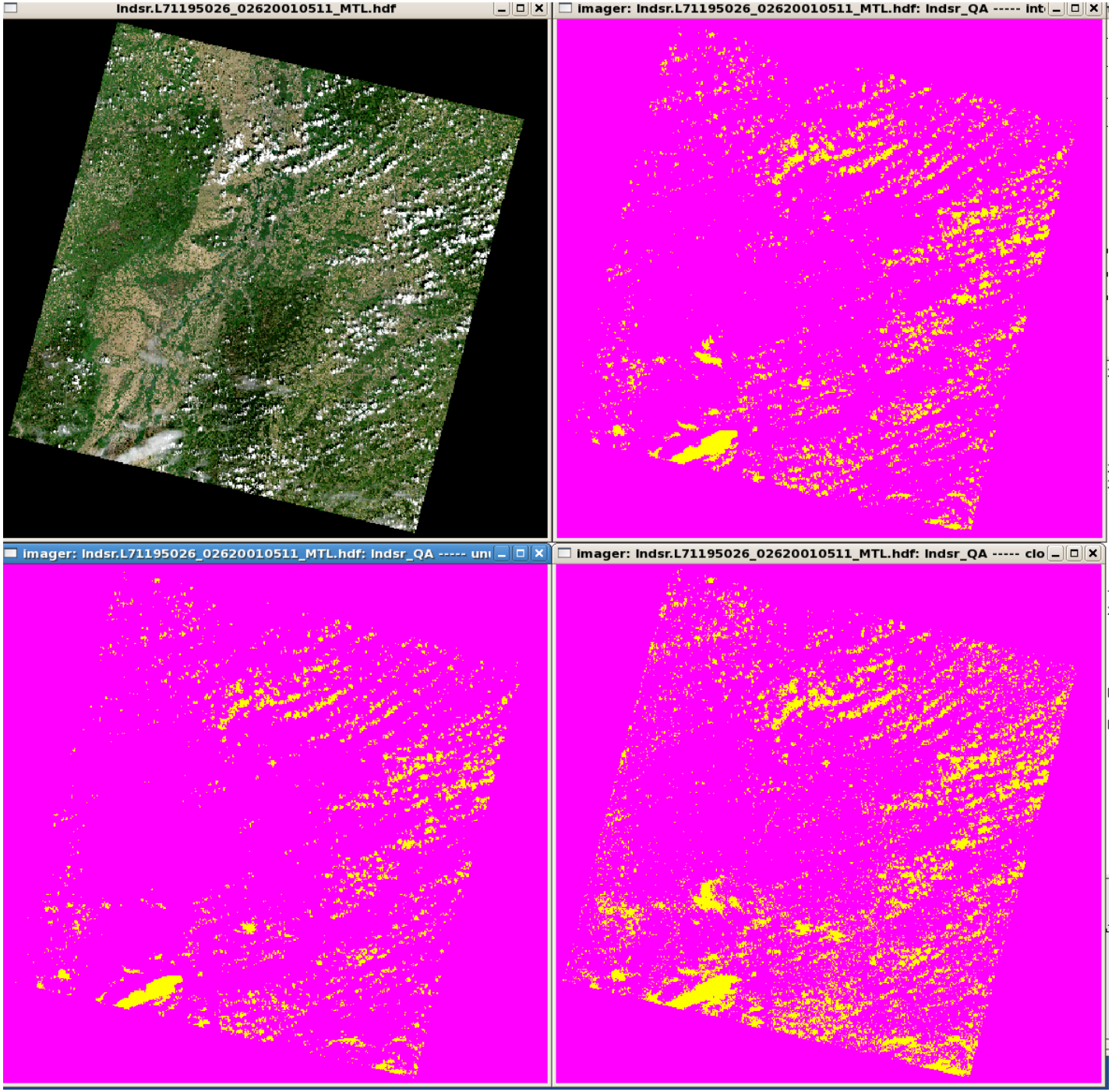
P186R32
(3)


lndsr.L71186032_03220011003_MTL.hdf
imager: lndsr.L71186032_03220011003_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71186032_03220011003_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71186032_03220011003_MTL.hdf: lndsr_QA ----- clo

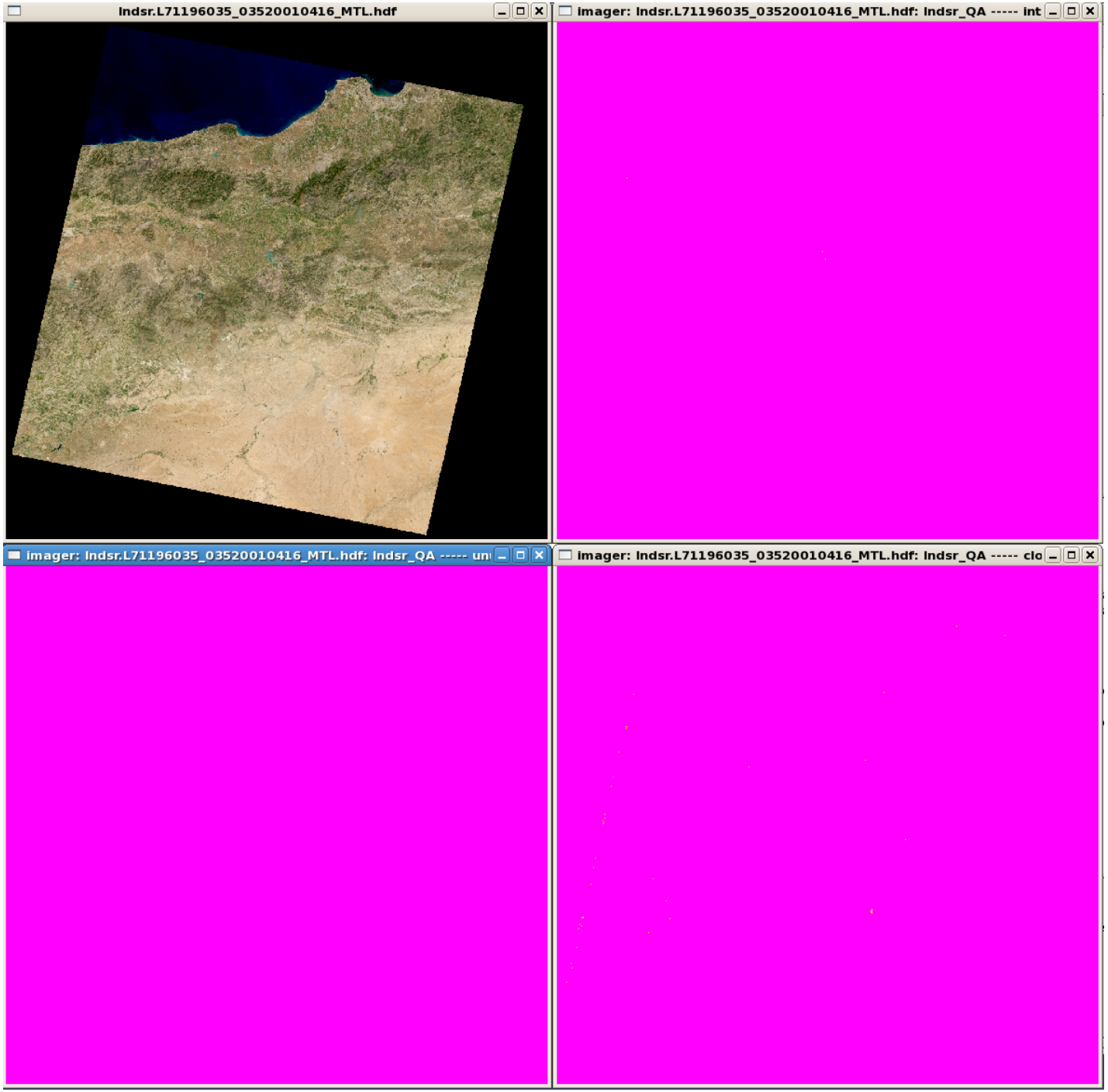
P186R32
(4)


lndsr.L71189021_02120010704_MTL.hdf
imager: lndsr.L71189021_02120010704_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71189021_02120010704_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71189021_02120010704_MTL.hdf: lndsr_QA ----- clo

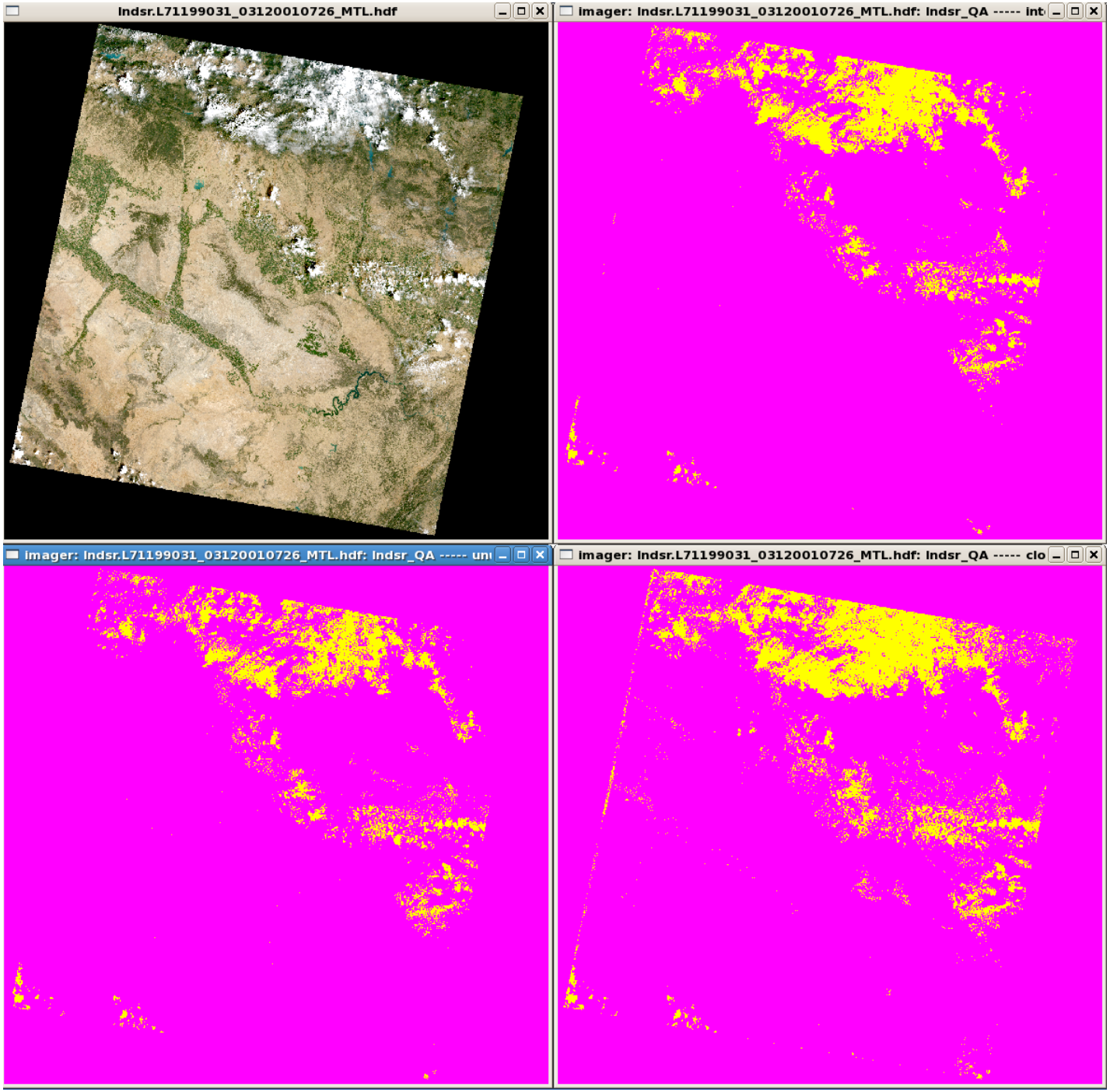
P189R21


lndsr.L71195026_02620010511_MTL.hdf
imager: lndsr.L71195026_02620010511_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71195026_02620010511_MTL.hdf: lndsr_QA ----- unı
imager: lndsr.L71195026_02620010511_MTL.hdf: lndsr_QA ----- clo

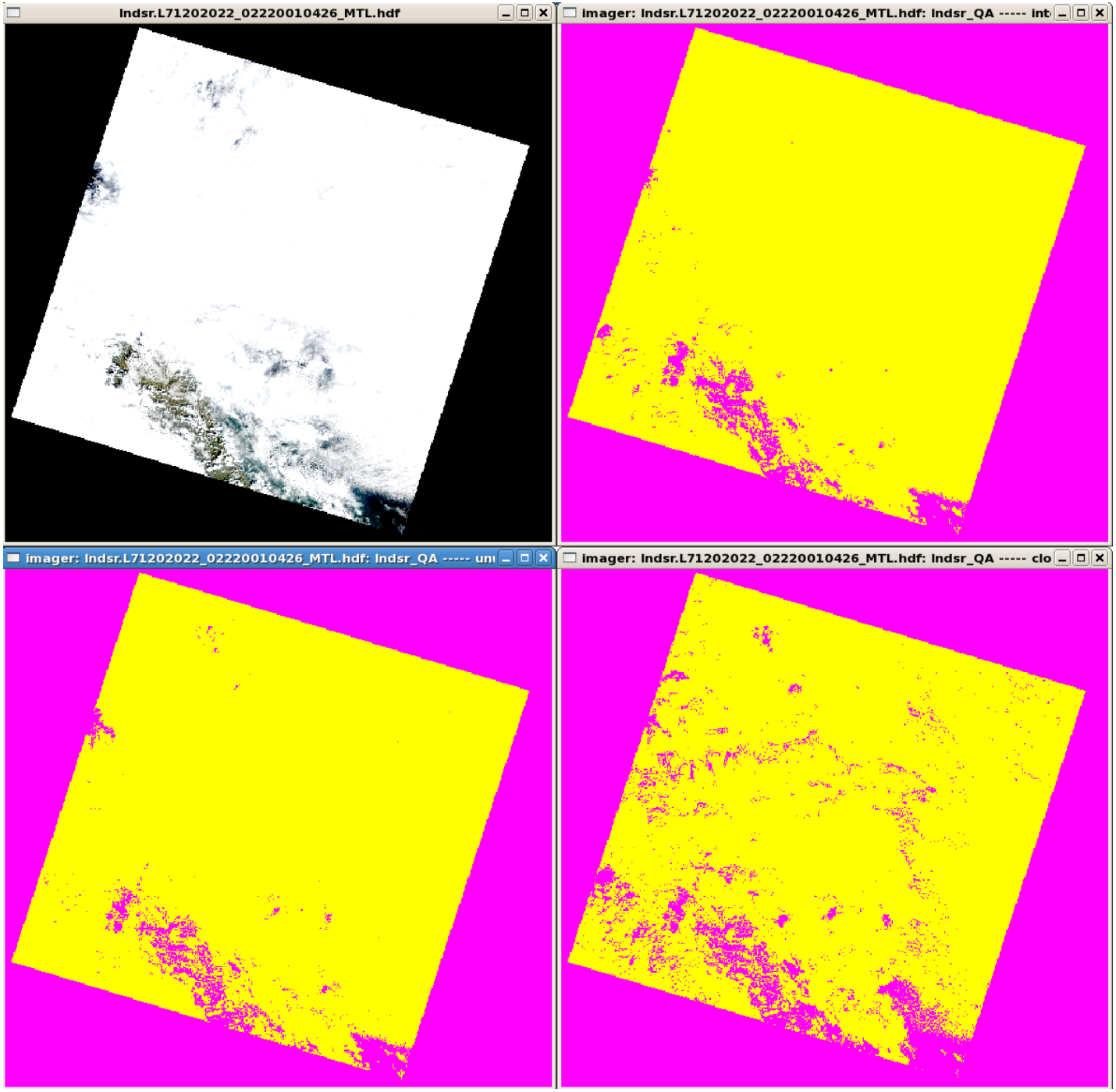
P195R26


lndsr.L71196035_03520010416_MTL.hdf
imager: lndsr.L71196035_03520010416_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71196035_03520010416_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71196035_03520010416_MTL.hdf: lndsr_QA ----- clo

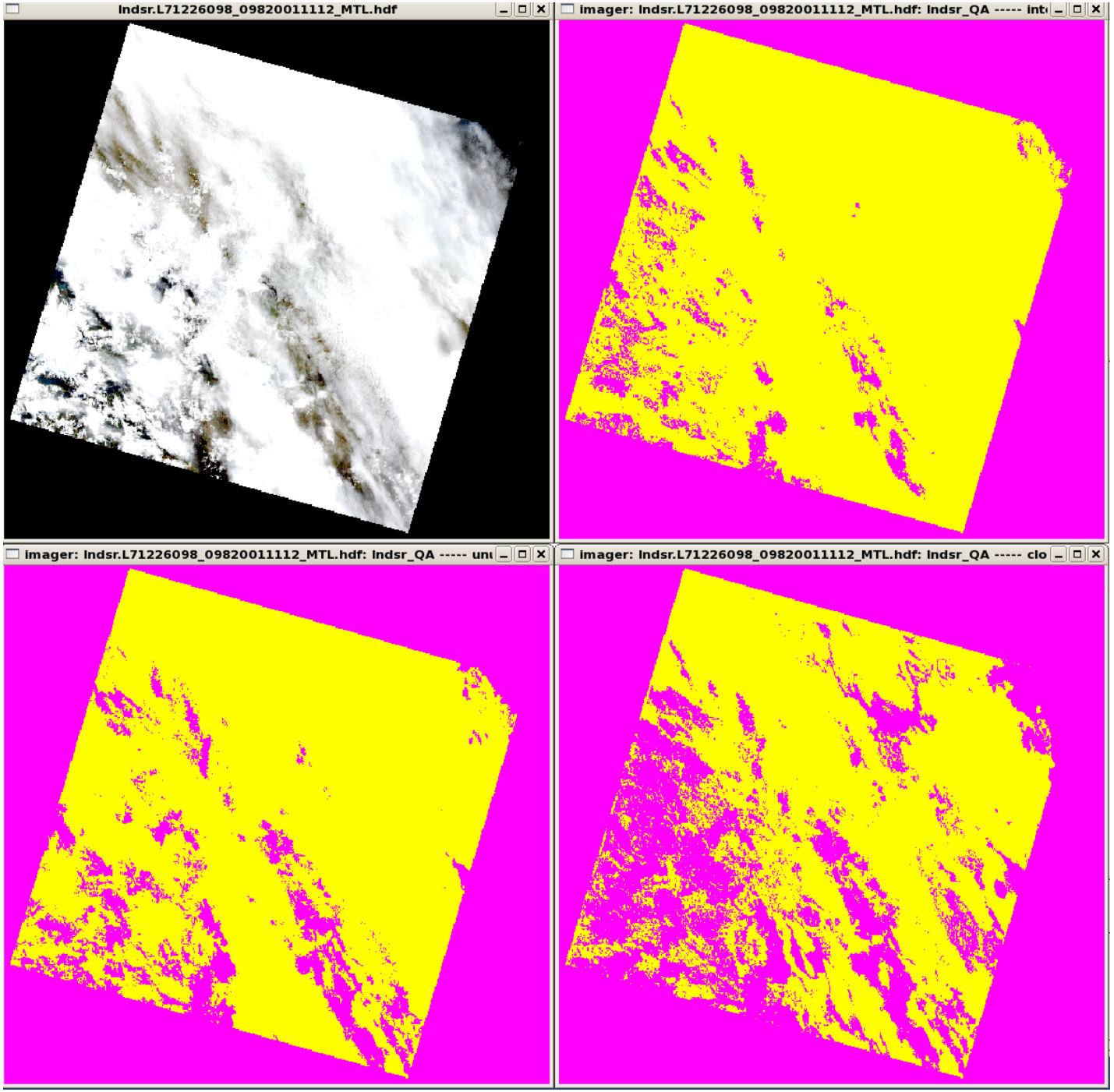
P196R35


lndsr.L71199031_03120010726_MTL.hdf
imager: lndsr.L71199031_03120010726_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71199031_03120010726_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71199031_03120010726_MTL.hdf: lndsr_QA ----- clo

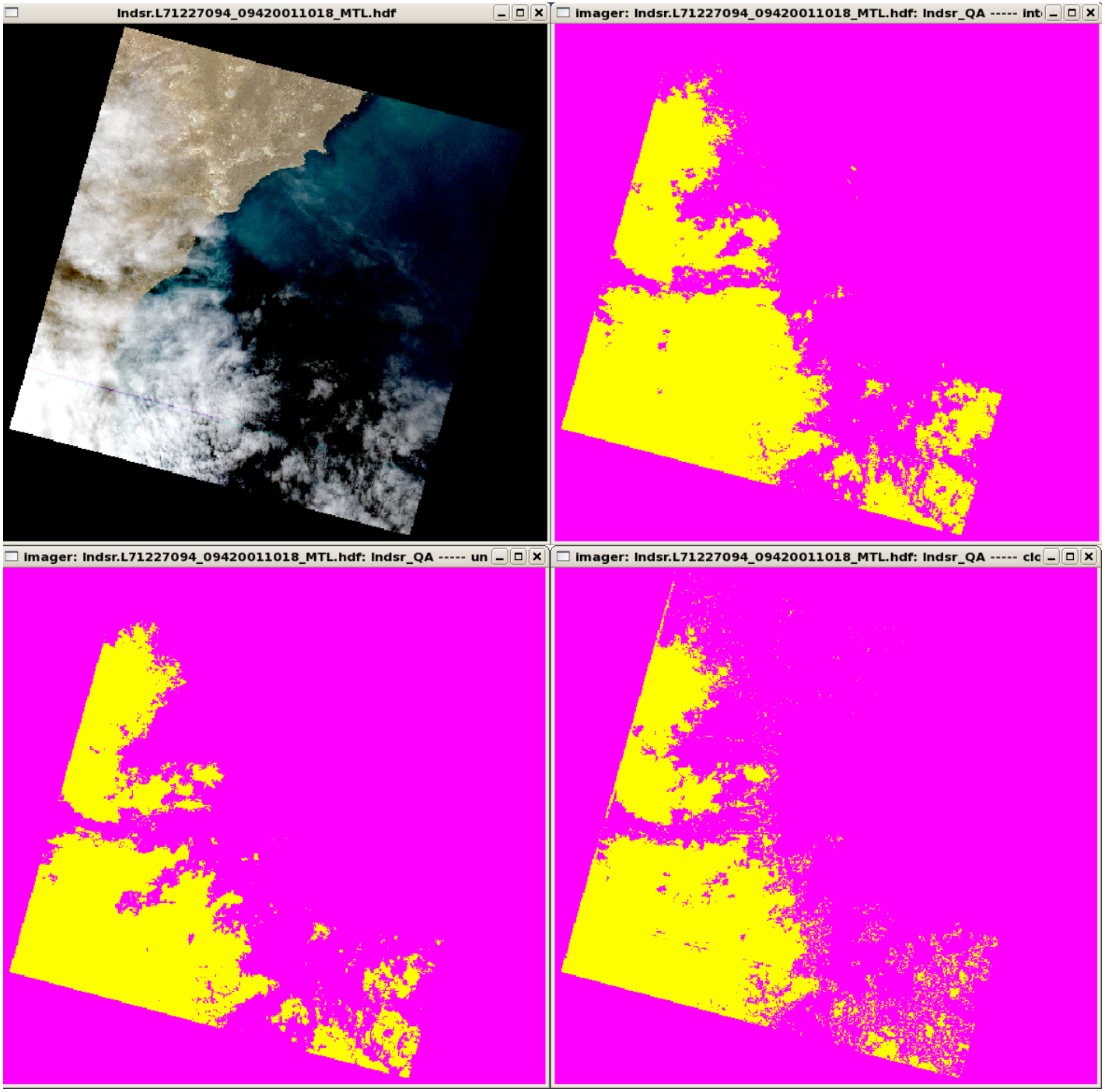
P199R31


lndsr.L71202022_02220010426_MTL.hdf
imager: lndsr.L71202022_02220010426_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71202022_02220010426_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71202022_02220010426_MTL.hdf: lndsr_QA ----- clo

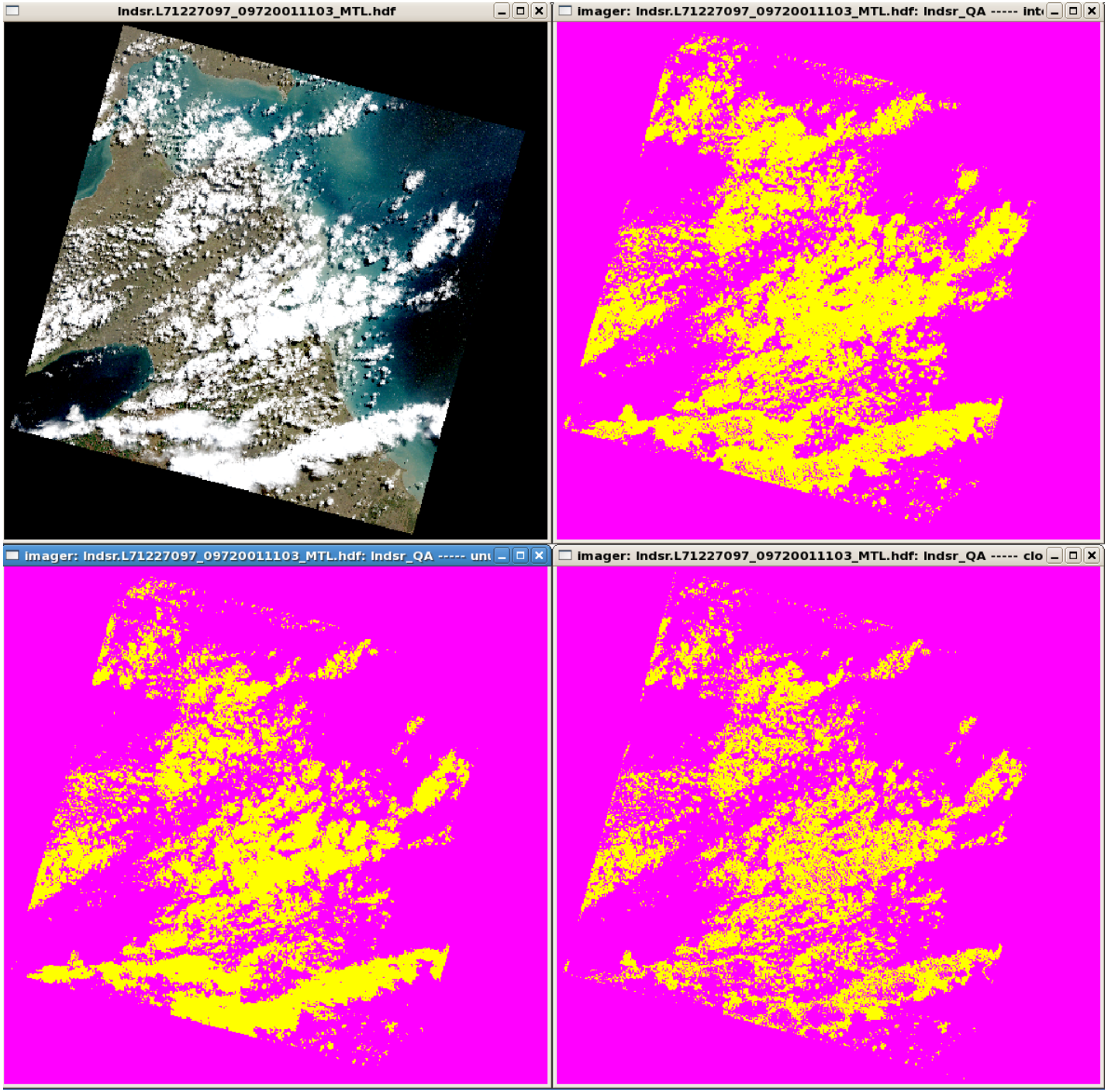
P202R22


lndsr.L71226098_09820011112_MTL.hdf
imager: lndsr.L71226098_09820011112_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71226098_09820011112_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71226098_09820011112_MTL.hdf: lndsr_QA ----- clo

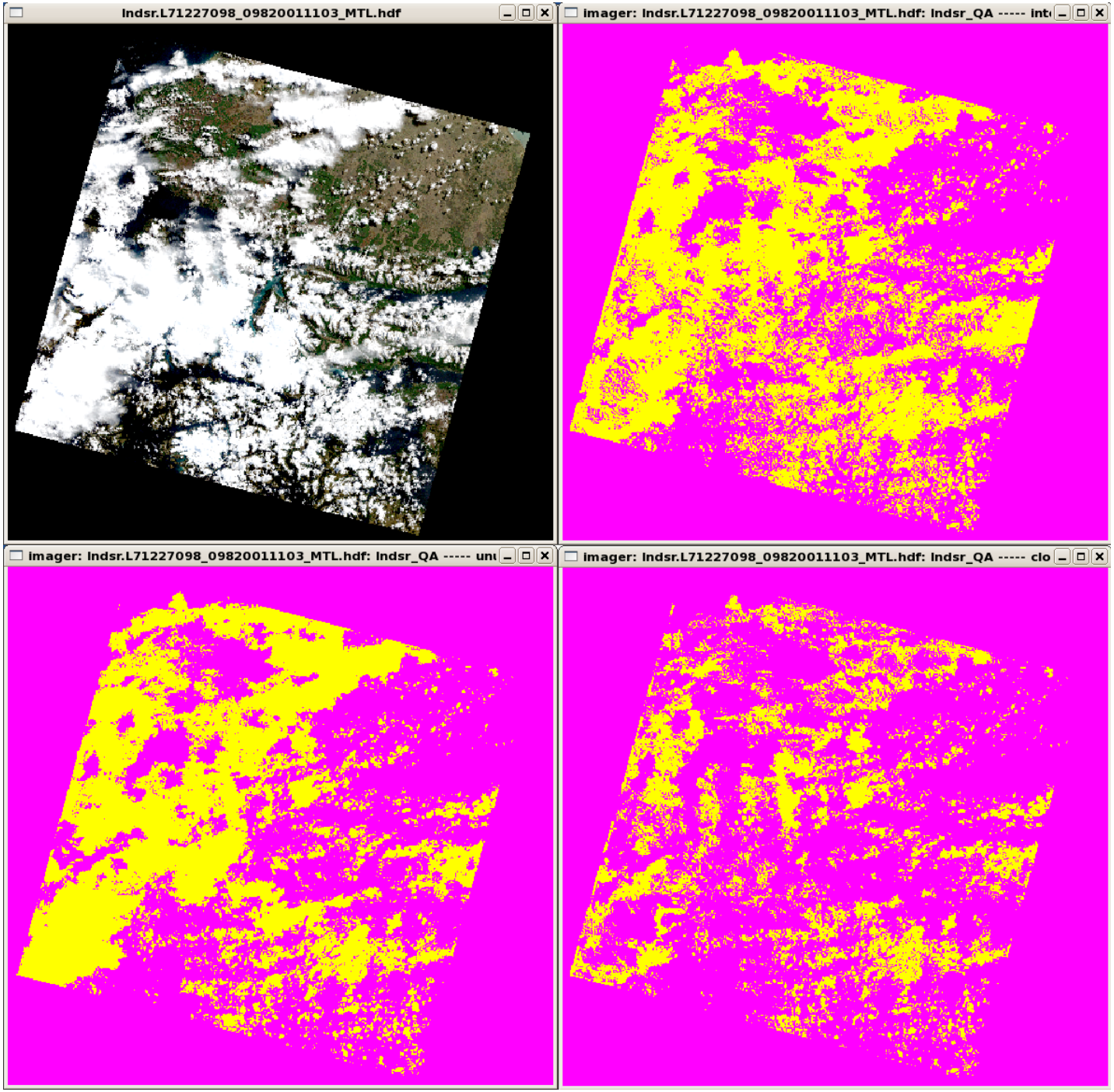
P226R98


lndsr.L71227094_09420011018_MTL.hdf
imager: lndsr.L71227094_09420011018_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71227094_09420011018_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71227094_09420011018_MTL.hdf: lndsr_QA ----- clo

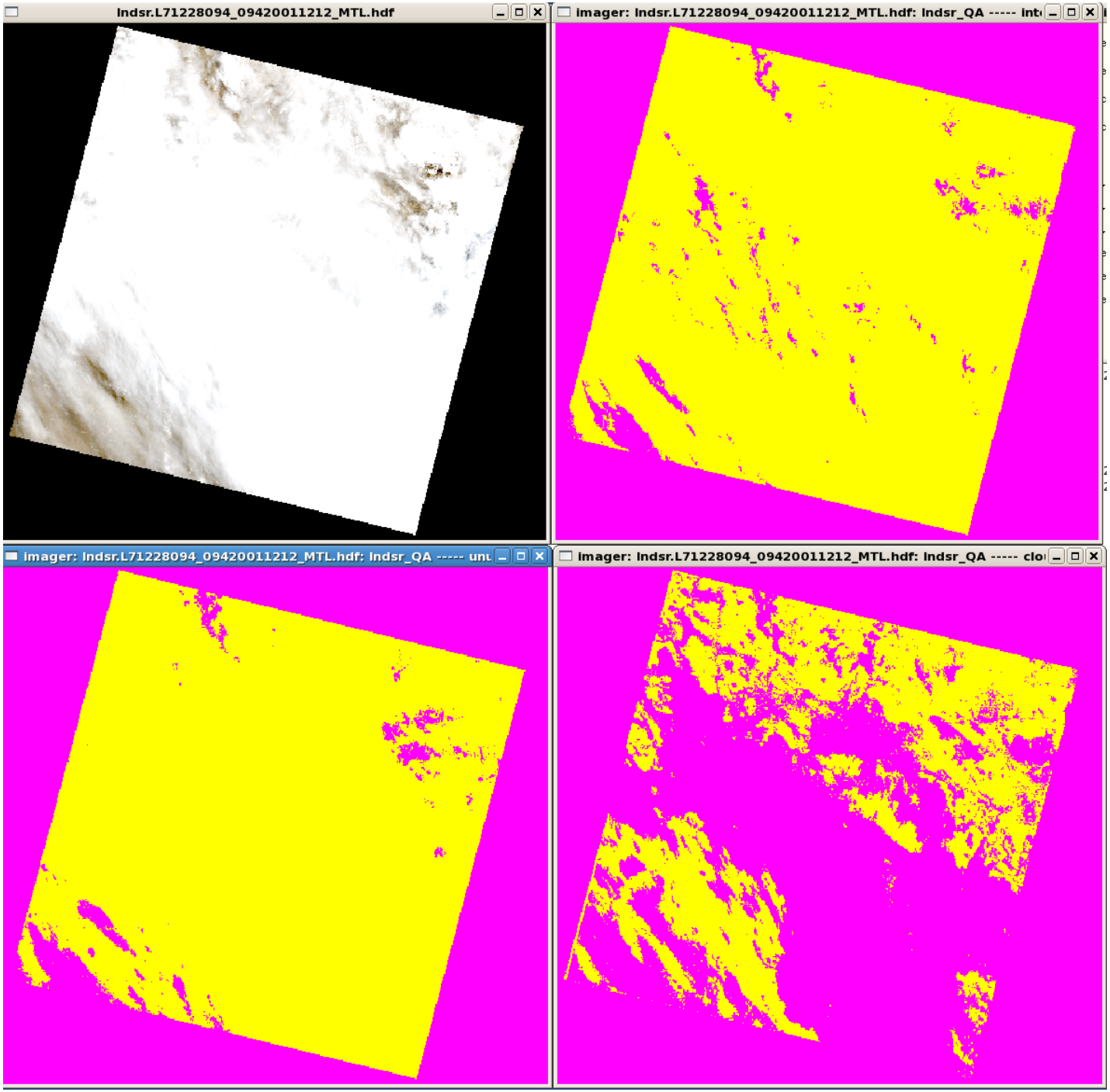
P227R94


lndsr.L71227097_09720011103_MTL.hdf
imager: lndsr.L71227097_09720011103_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71227097_09720011103_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71227097_09720011103_MTL.hdf: lndsr_QA ----- clo

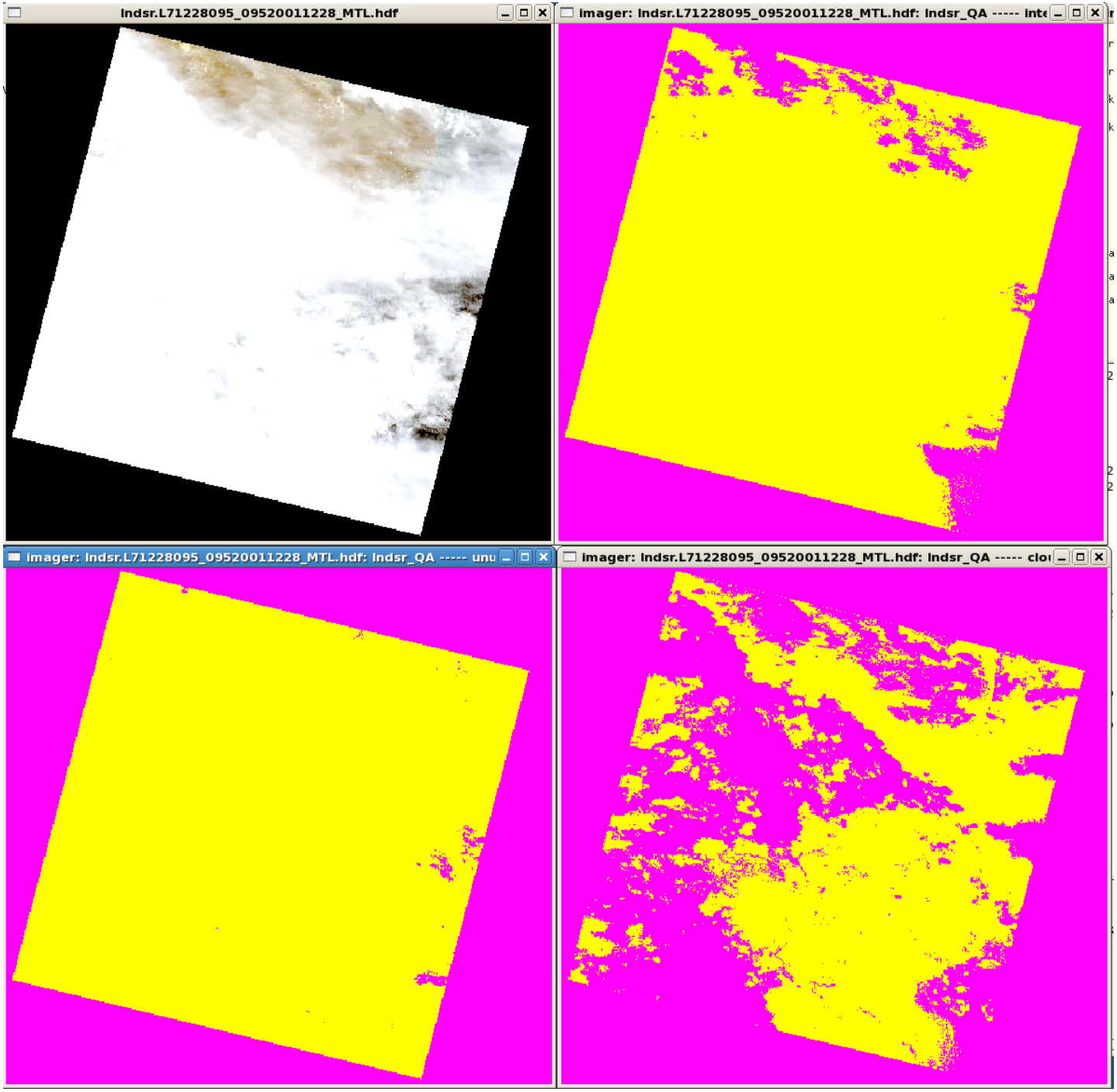
P227R97


lndsr.L71227098_09820011103_MTL.hdf
imager: lndsr.L71227098_09820011103_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71227098_09820011103_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71227098_09820011103_MTL.hdf: lndsr_QA ----- clo

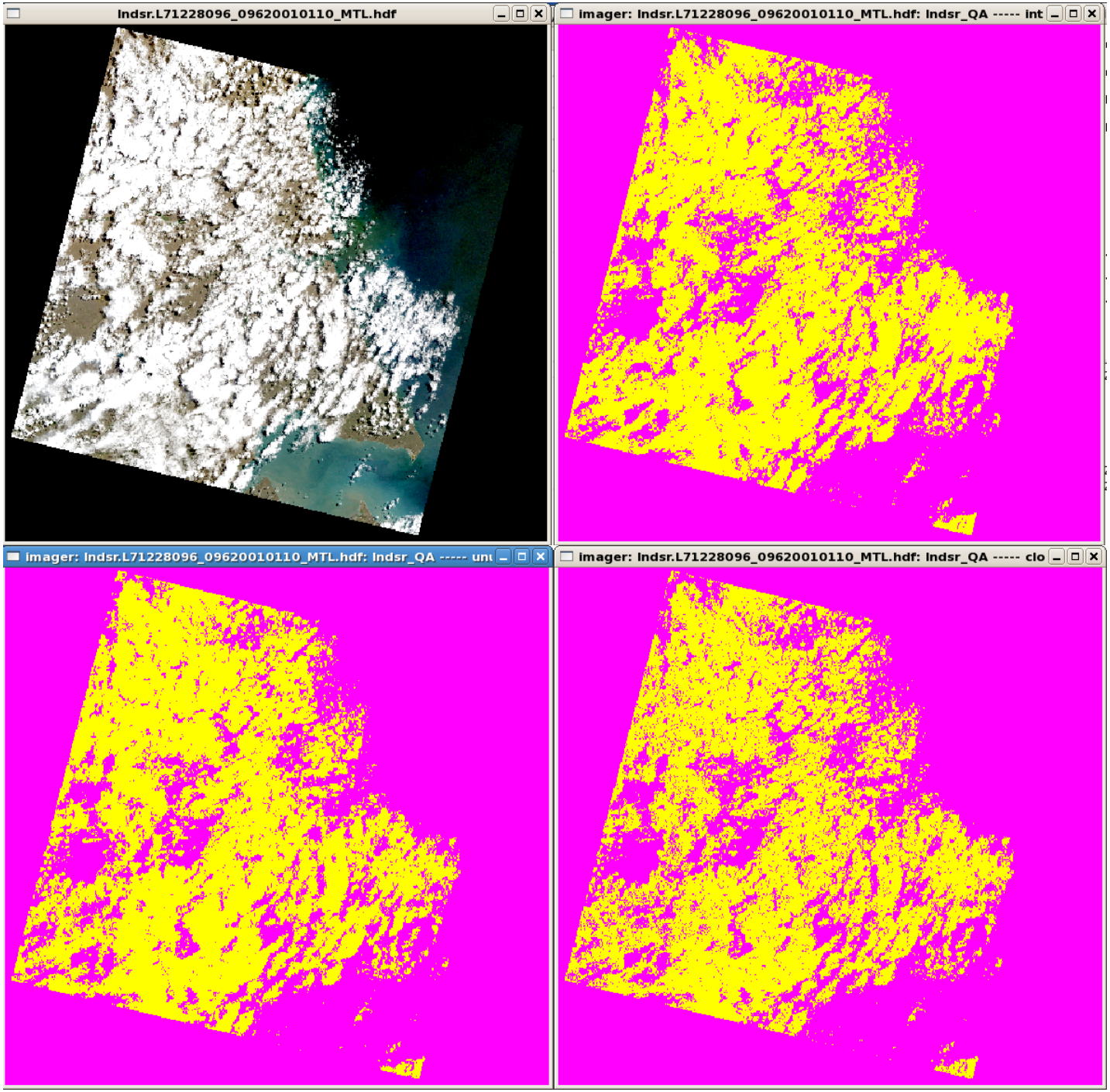
P227R98


lndsr.L71228094_09420011212_MTL.hdf
imager: lndsr.L71228094_09420011212_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71228094_09420011212_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71228094_09420011212_MTL.hdf: lndsr_QA ----- clo

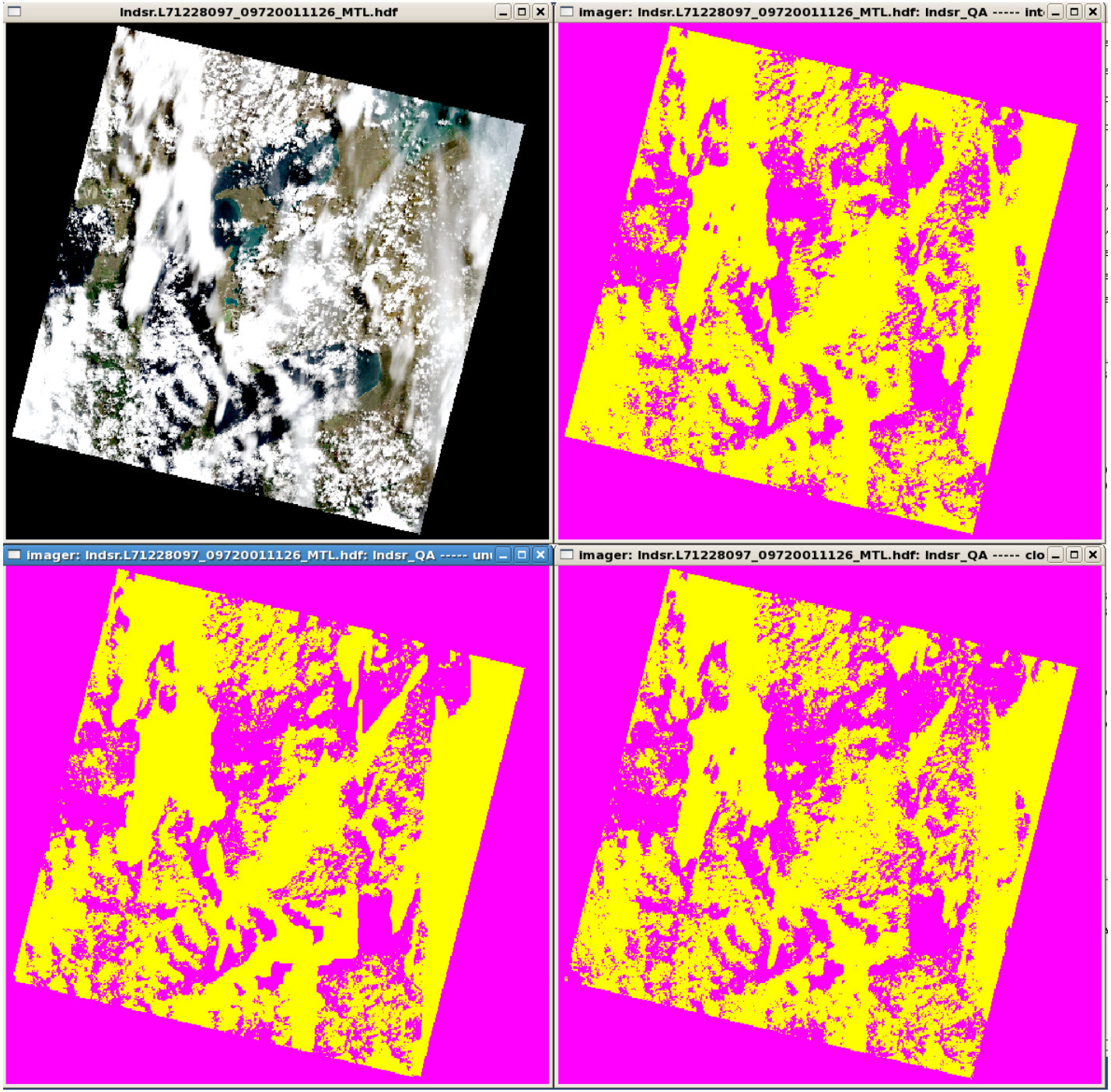
P228R94


lndsr.L71228095_09520011228_MTL.hdf
imager: lndsr.L71228095_09520011228_MTL.hdf: lndsr_QA ----- inte
imager: lndsr.L71228095_09520011228_MTL.hdf: lndsr_QA ----- unu
imager: lndsr.L71228095_09520011228_MTL.hdf: lndsr_QA ----- clo

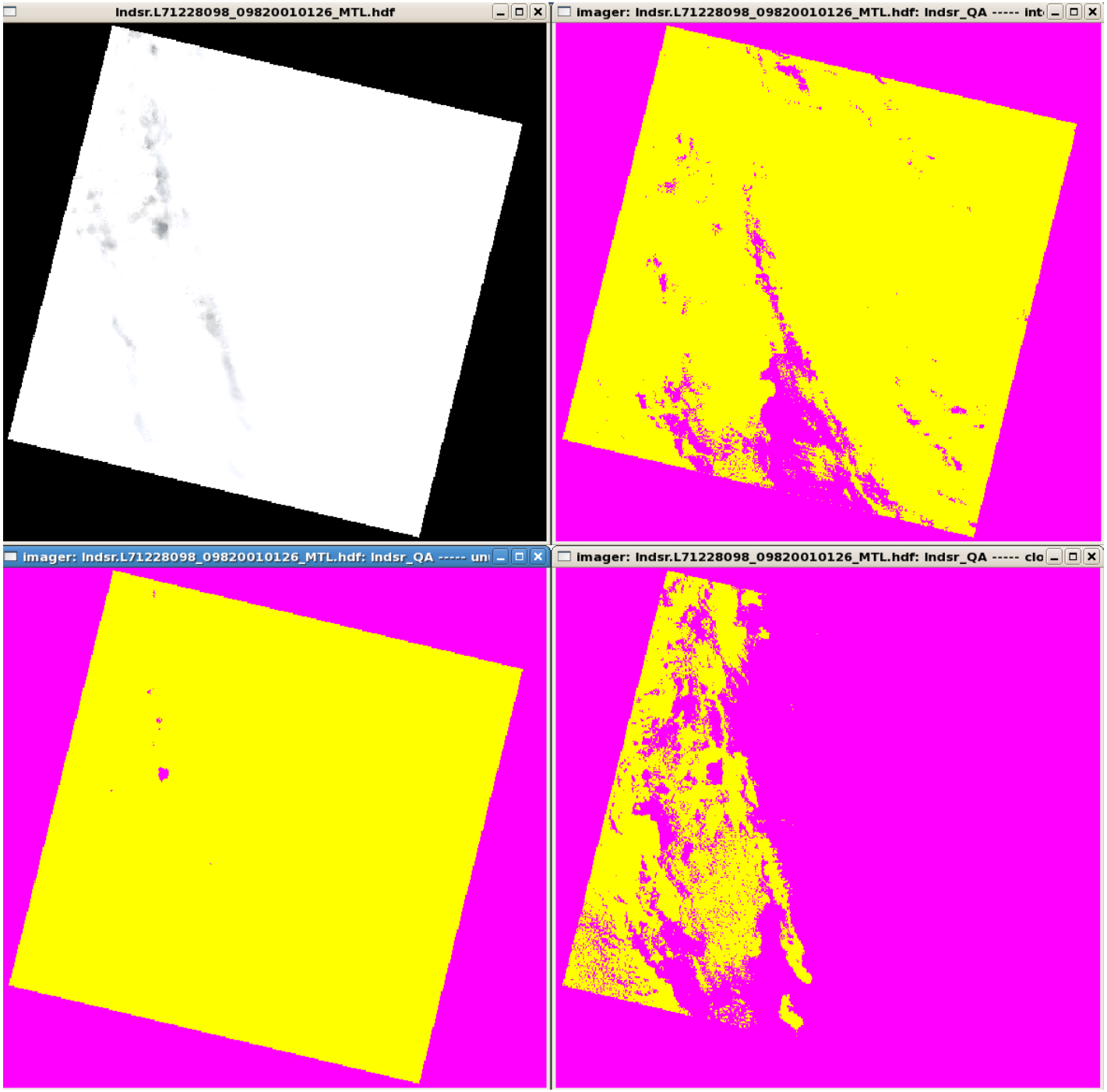
P228R95


lndsr.L71228096_09620010110_MTL.hdf
imager: lndsr.L71228096_09620010110_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71228096_09620010110_MTL.hdf: lndsr_QA ----- unc
imager: lndsr.L71228096_09620010110_MTL.hdf: lndsr_QA ----- clo

P228R96

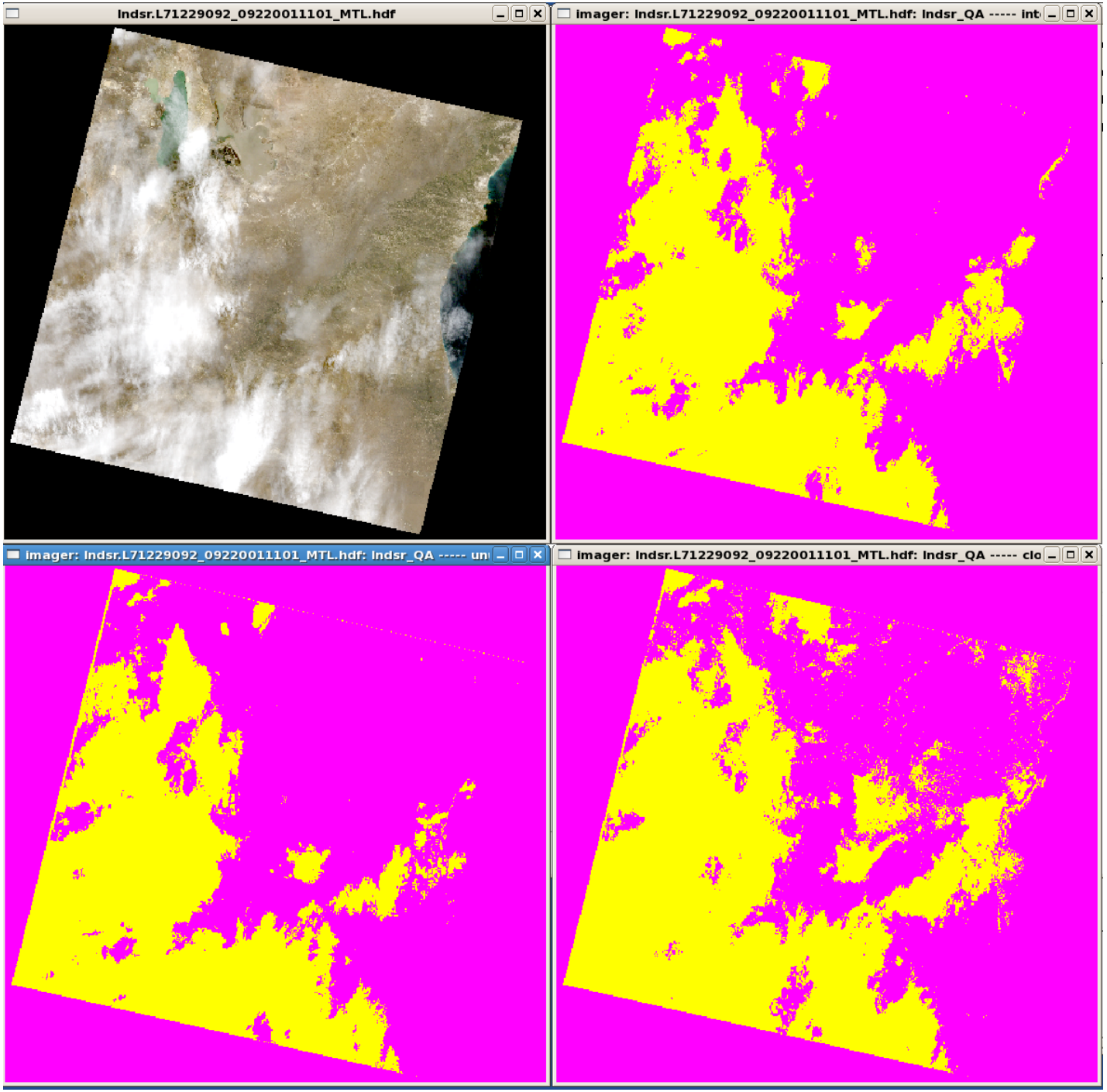

lndsr.L71228097_09720011126_MTL.hdf
imager: lndsr.L71228097_09720011126_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71228097_09720011126_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71228097_09720011126_MTL.hdf: lndsr_QA ----- clo

P228R97

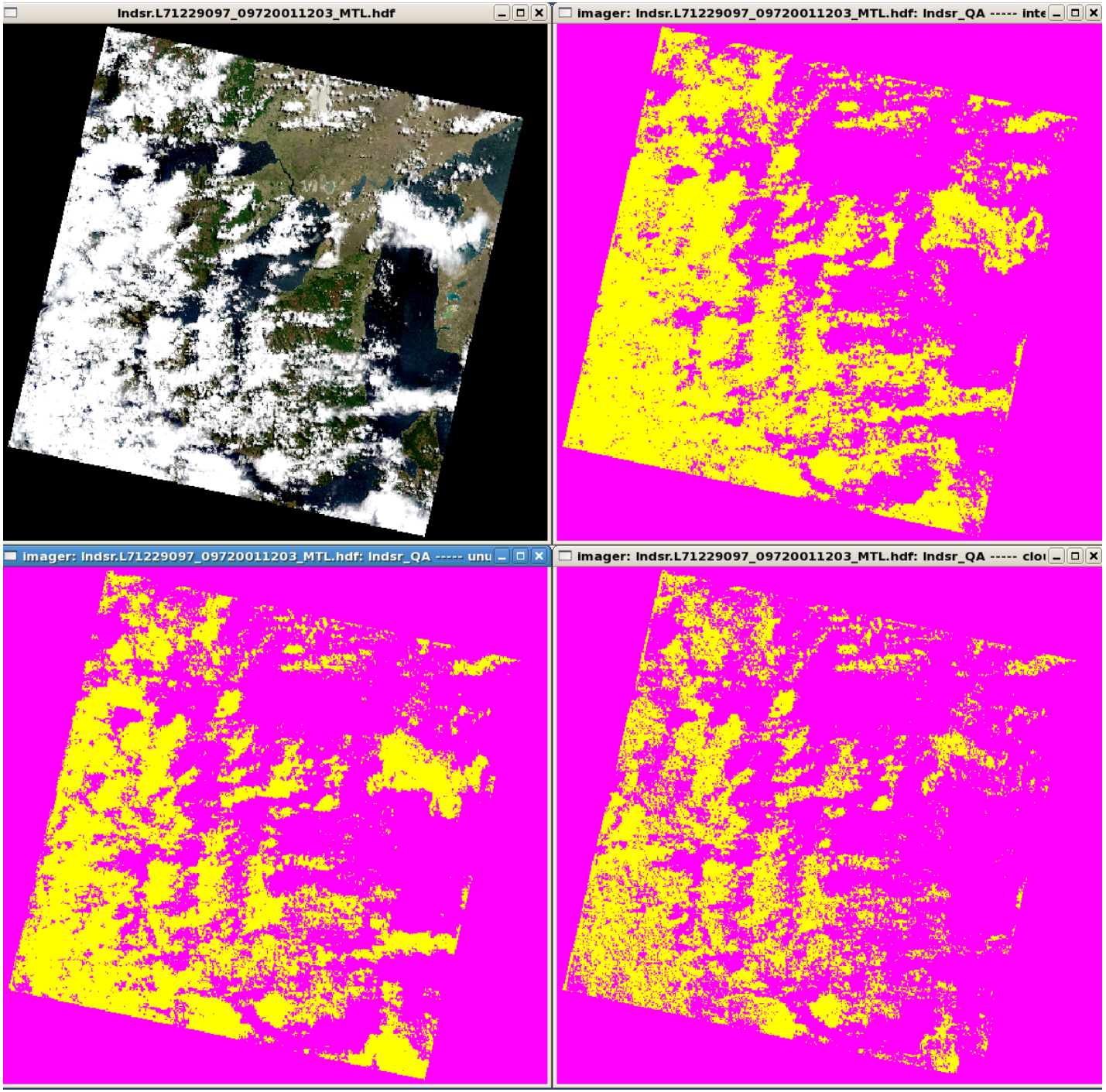


P228R98

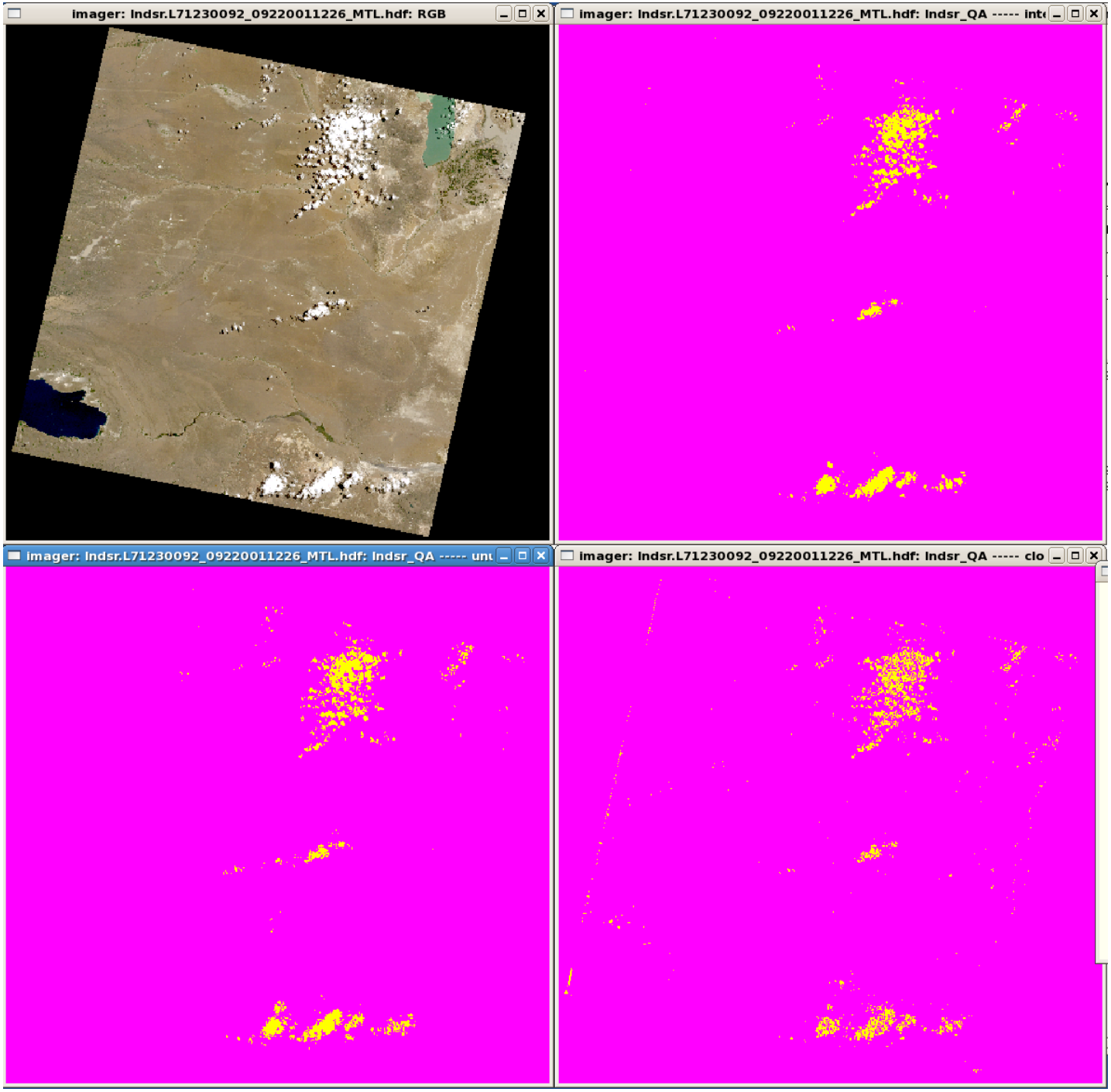
Leakage
8%


lndsr.L71229092_09220011101_MTL.hdf
imager: lndsr.L71229092_09220011101_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71229092_09220011101_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71229092_09220011101_MTL.hdf: lndsr_QA ----- clo

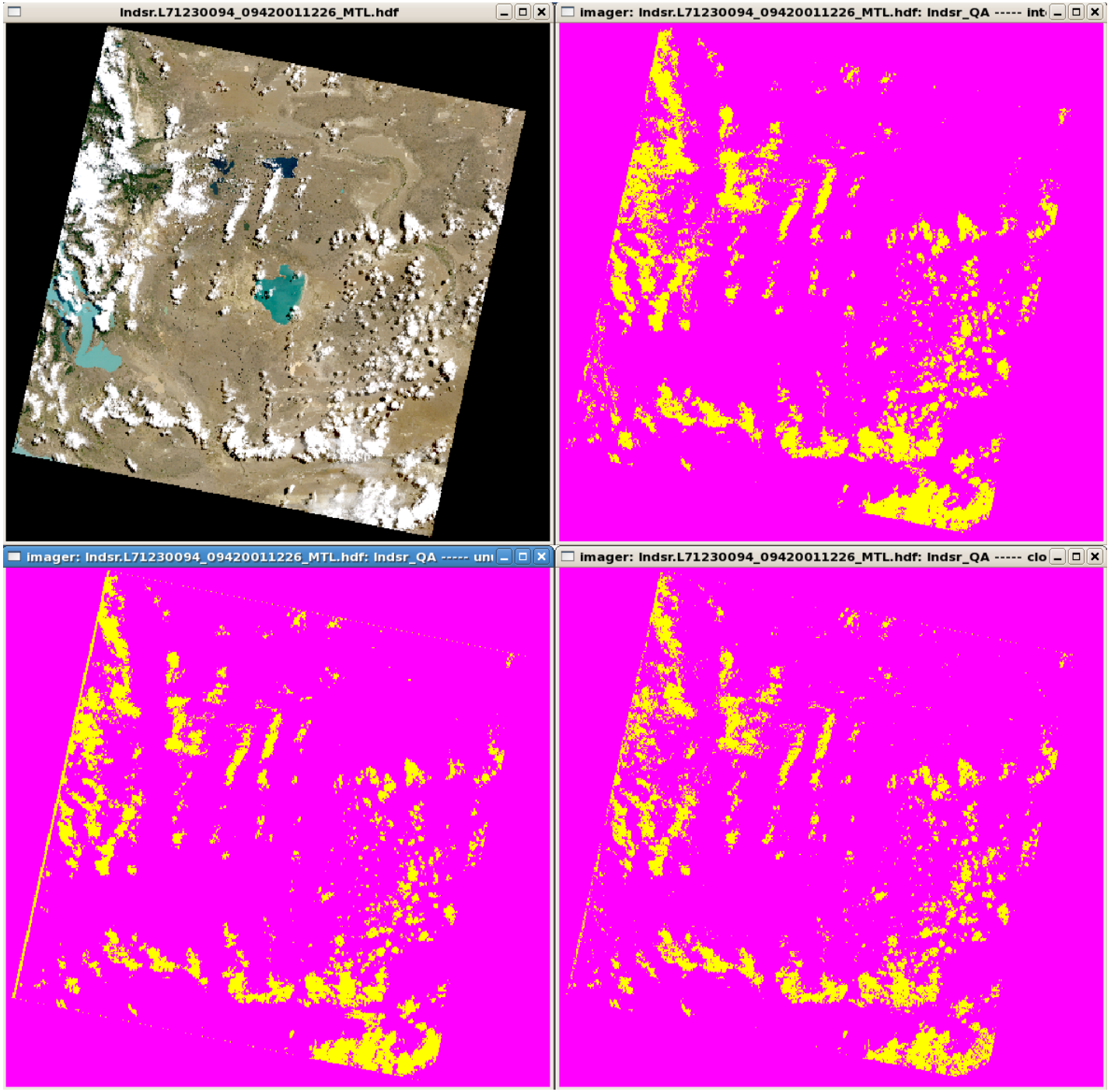
P229R92


lndsr.L71229097_09720011203_MTL.hdf
imager: lndsr.L71229097_09720011203_MTL.hdf: lndsr_QA ----- inte
imager: lndsr.L71229097_09720011203_MTL.hdf: lndsr_QA ----- unu
imager: lndsr.L71229097_09720011203_MTL.hdf: lndsr_QA ----- clo

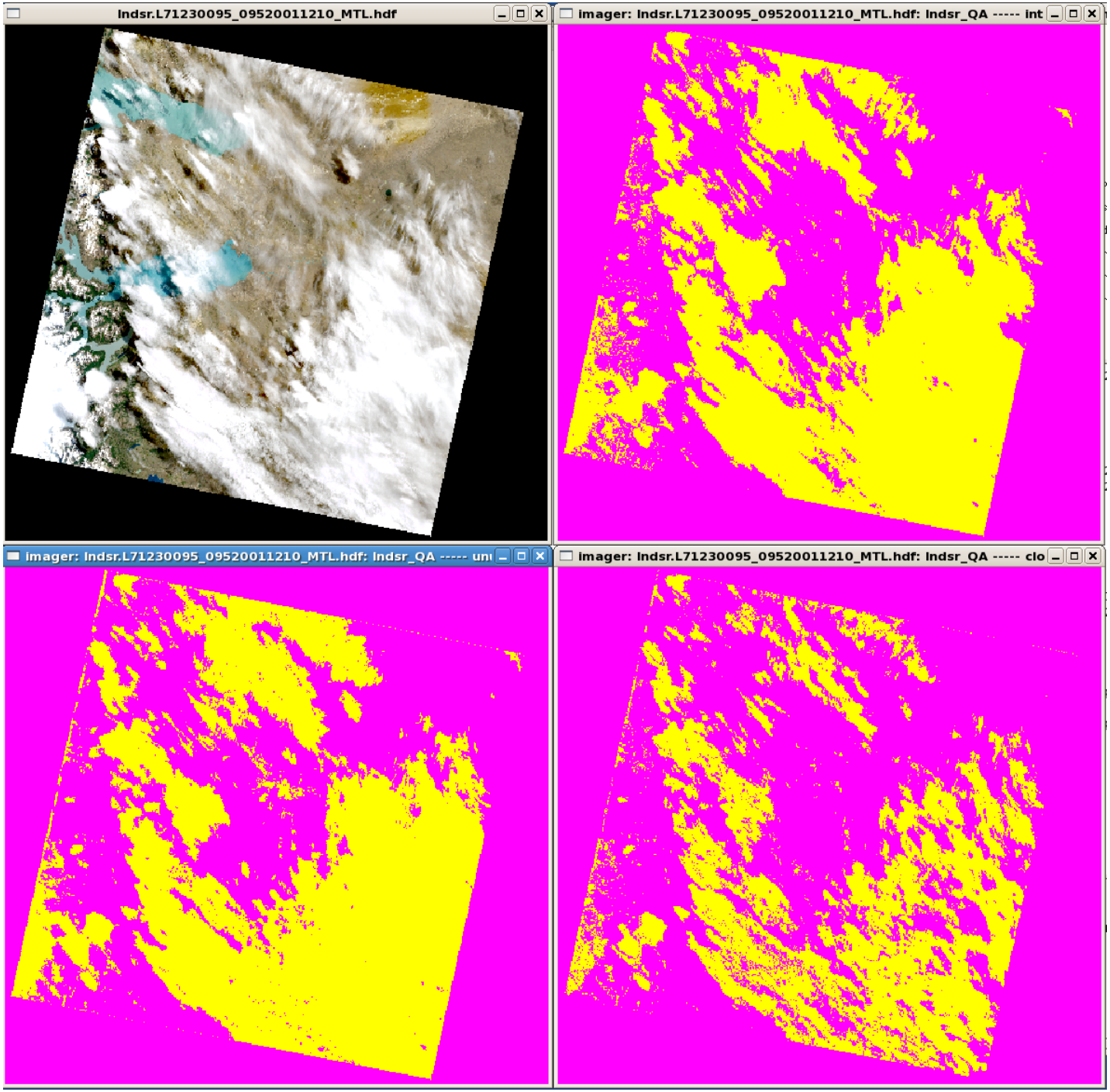
P229R97


imager: lndsr.L71230092_09220011226_MTL.hdf: RGB
imager: lndsr.L71230092_09220011226_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71230092_09220011226_MTL.hdf: lndsr_QA ----- unt
imager: lndsr.L71230092_09220011226_MTL.hdf: lndsr_QA ----- clo

P230R92


lndsr.L71230094_09420011226_MTL.hdf
imager: lndsr.L71230094_09420011226_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71230094_09420011226_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71230094_09420011226_MTL.hdf: lndsr_QA ----- clo

P230R94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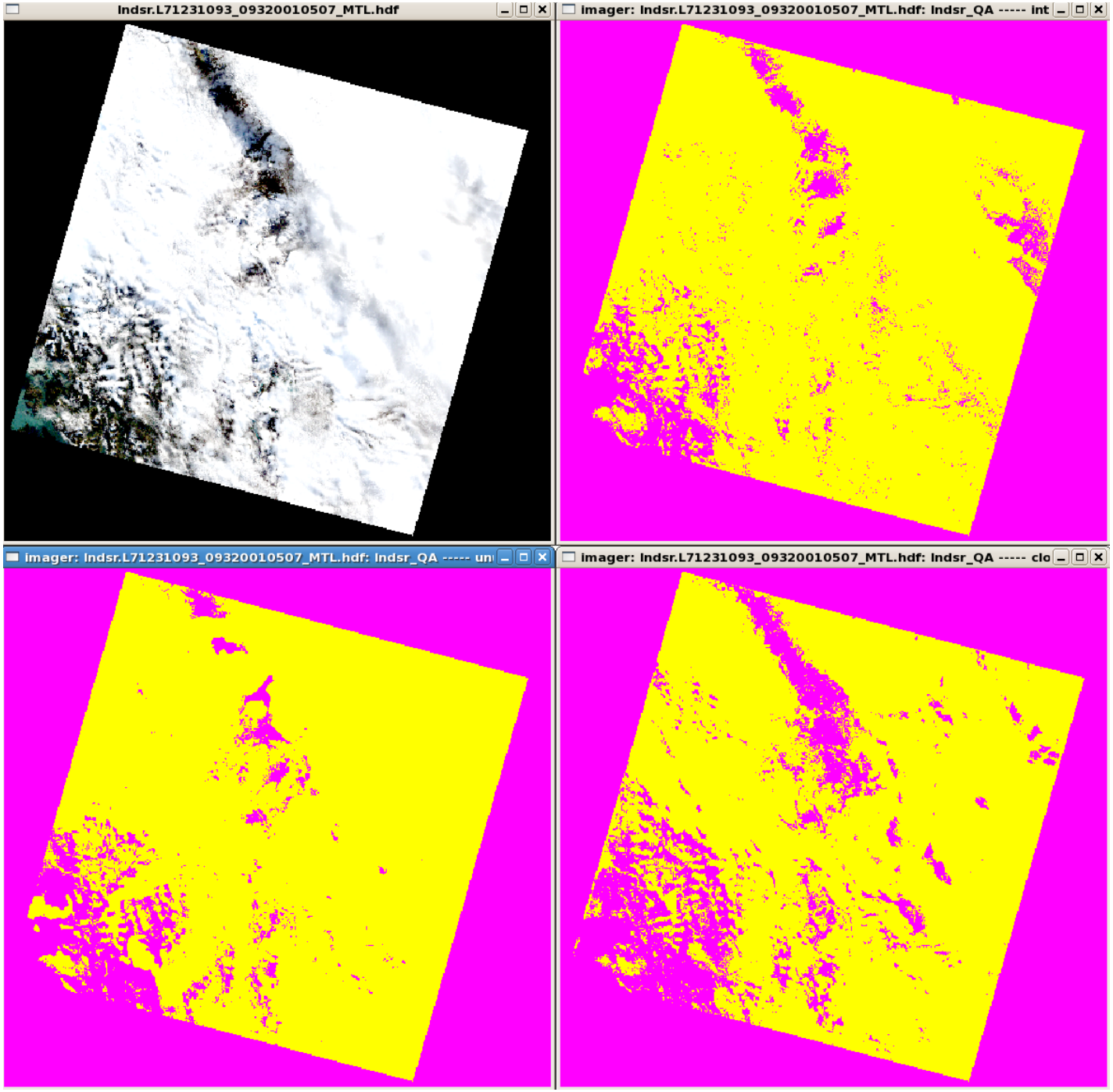
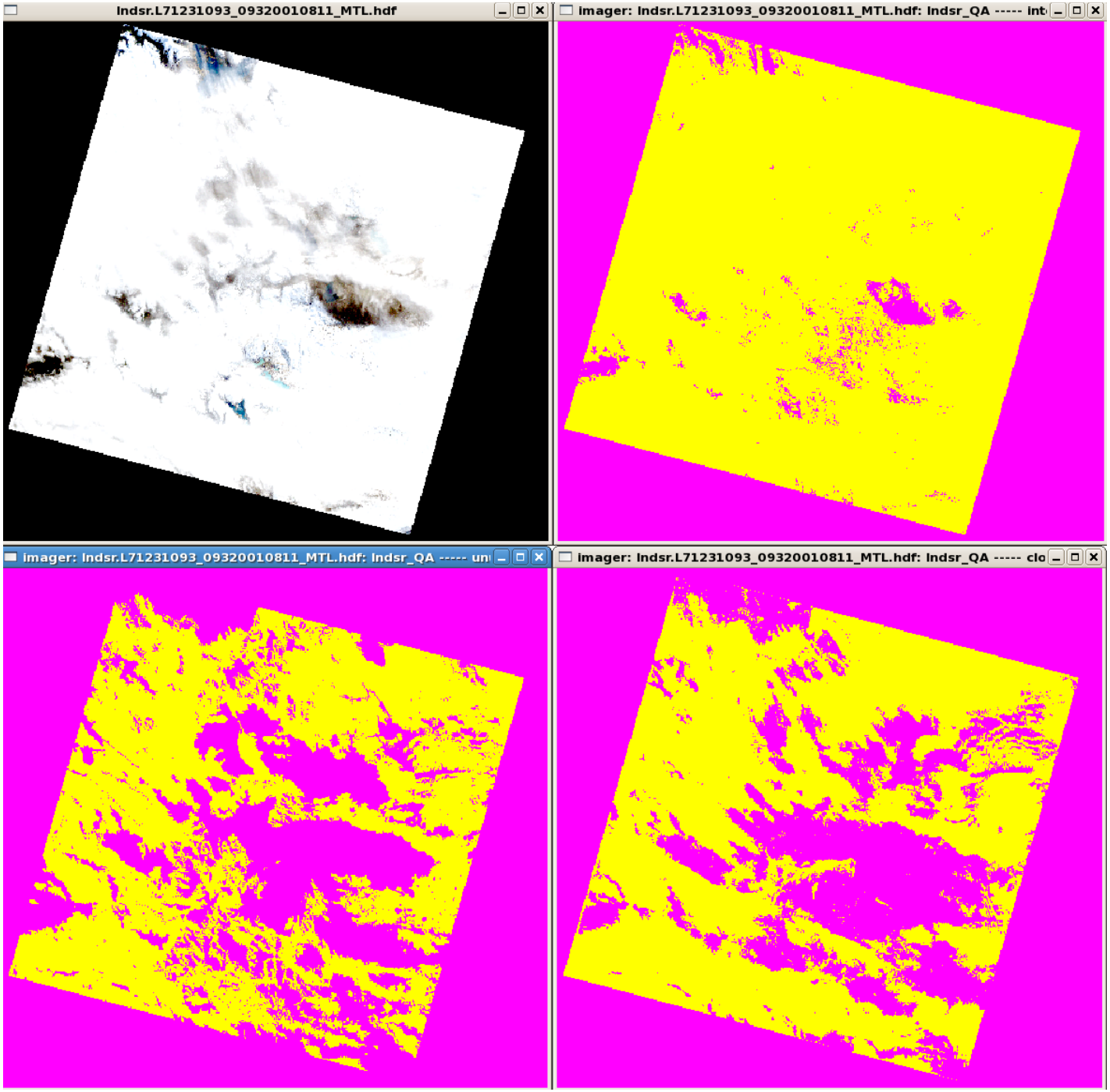
imager: lndsr.L71230095_09520011210_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71230095_09520011210_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71230095_09520011210_MTL.hdf: lndsr_QA ----- clo

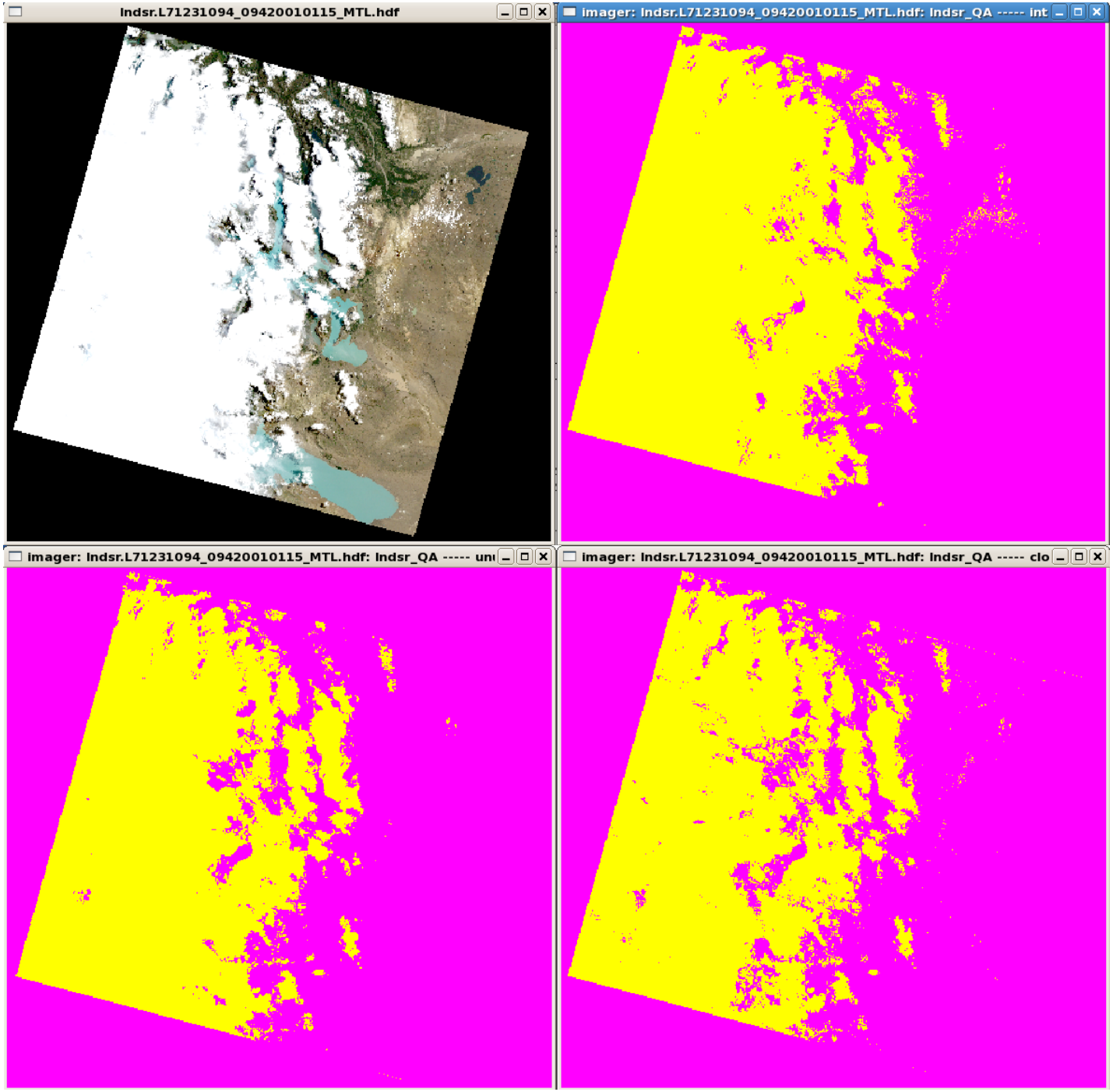
P230R95


lndsr.L71231093_09320010507_MTL.hdf
imager: lndsr.L71231093_09320010507_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71231093_09320010507_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71231093_09320010507_MTL.hdf: lndsr_QA ----- clo

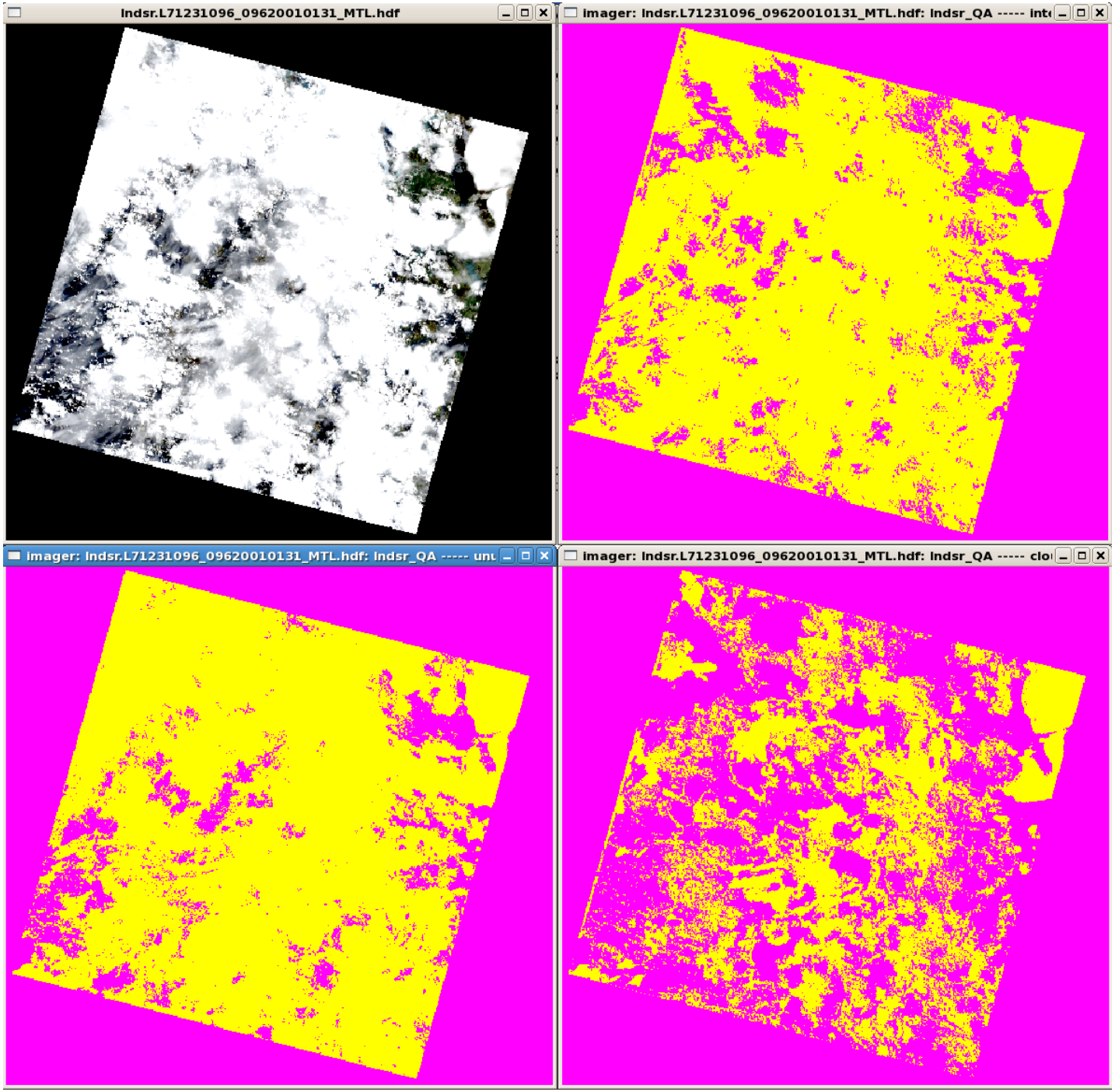
P231R93
(2)


lndsr.L71231093_09320010811_MTL.hdf
imager: lndsr.L71231093_09320010811_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71231093_09320010811_MTL.hdf: lndsr_QA ----- un
imager: lndsr.L71231093_09320010811_MTL.hdf: lndsr_QA ----- clo

P231R93
(3)


lndsr.L71231094_09420010115_MTL.hdf
imager: lndsr.L71231094_09420010115_MTL.hdf: lndsr_QA ----- int
imager: lndsr.L71231094_09420010115_MTL.hdf: lndsr_QA ----- uni
imager: lndsr.L71231094_09420010115_MTL.hdf: lndsr_QA ----- clo

P231R94



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Leakage
9%