Validation of Global Fire Disturbance Products

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Why Validate?

- Global products attempt something very different to regional products
  - Variety of users (climate, ecology…)
  - Must have consistent performance over wide range of vegetation types and burning conditions
- Several products available
  - Users should be able to understand what product more suited for their need
- Iterative process: feedback from validation allows future improvements

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- Identification of users and their needs
  - Who are the key users of global products?
  - What are their validation requirements?
  - What do they need to know?
- Characterising Accuracy and uncertainty of the product
  - Can the product be calibrated to obtain unbiased estimates at coarser scales
  - How can we represent uncertainty in the data?
  - Who validates? Data producer or independent body? (will be an issue with ECVs)
  - Is there any basis to establish uncertainty requirements?

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Q&A

- Validation – open issues
  - How to calibrate data (unbiased estimate at coarser resolution)
  - Uncertainty measures and how to make use of them?
  - Transition from Stage 2 (expert based selection of the validation sites) to Stage 3 (model based statistical sampling) is needed to fully characterize uncertainty
  - How can we communicate products and their accuracies better to non-scientists
    - Standard reporting form and update reports

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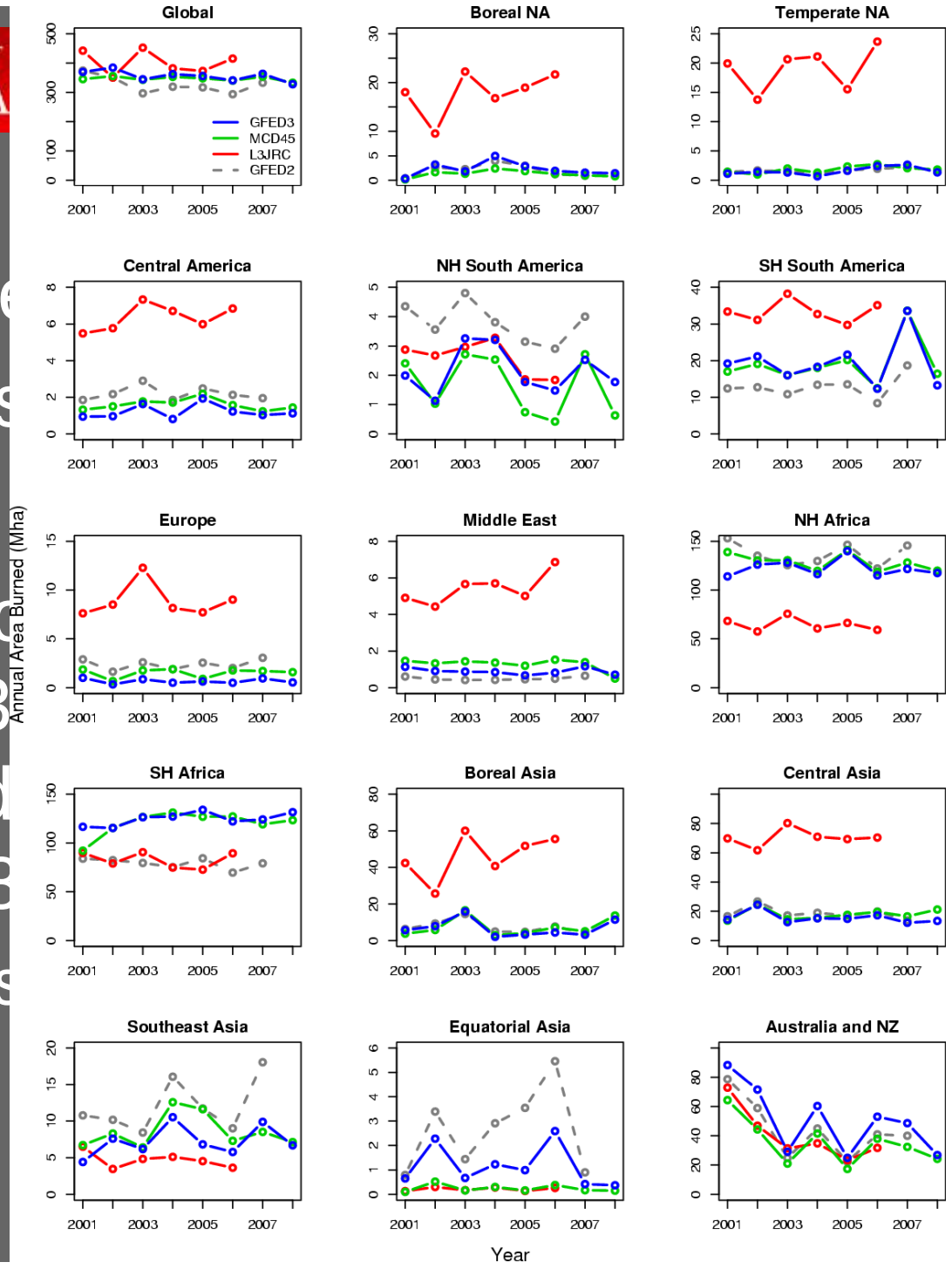
- Shed light of diffe
- Limited usefulnes
- Chang, D., and Sc
  Comparison of L3
  burned area prod
  doi:10.1029/2008
  - Might not have us

Giglio et al., 2010



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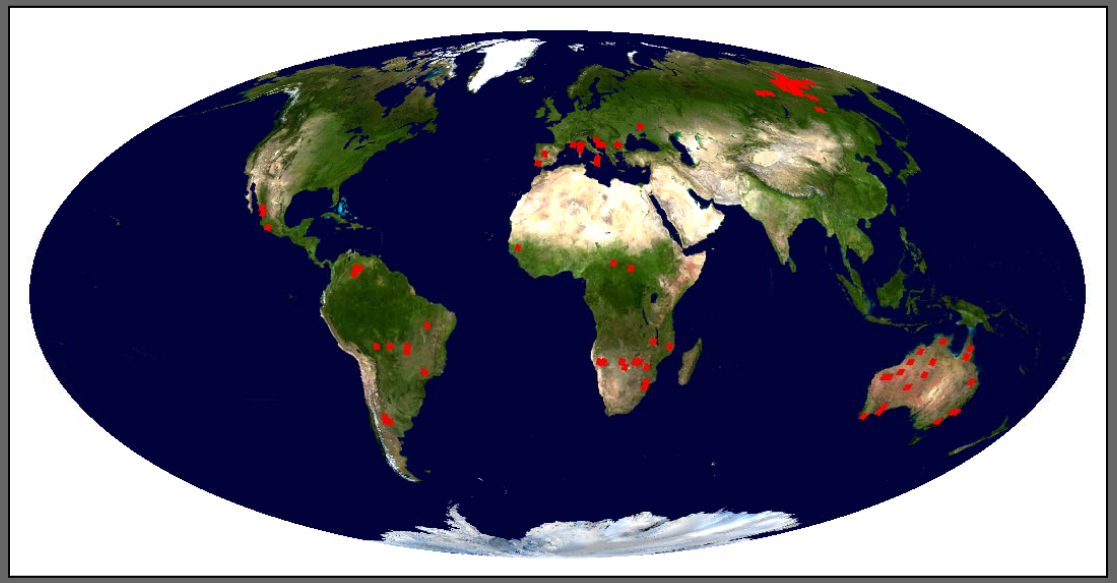
The case for Stage 3 validation

- MODIS Stage 2 validation dataset
- 80 Landsat image pairs
- GOFC-GOLD regional expert interpretation



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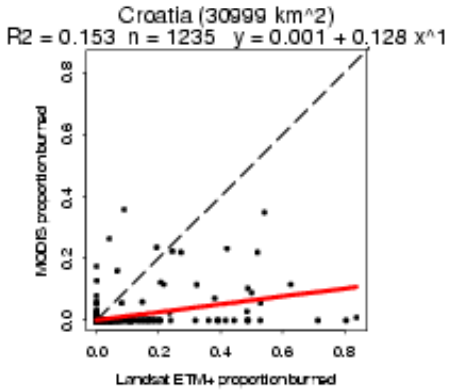
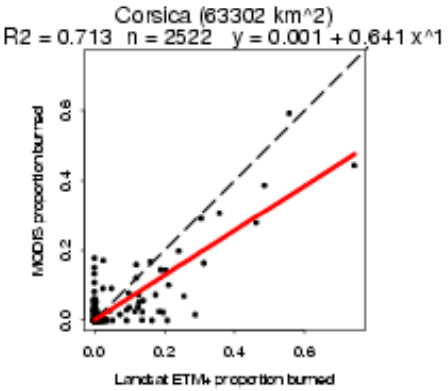
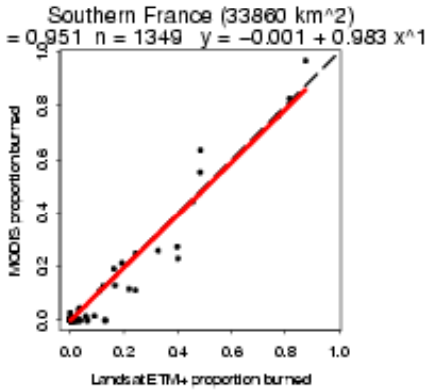
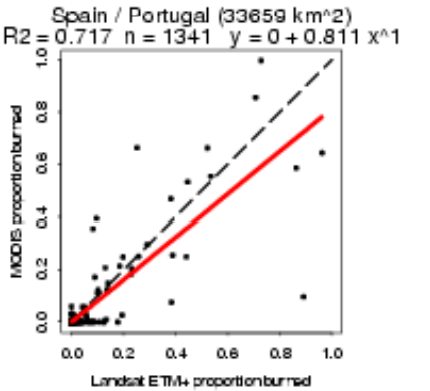
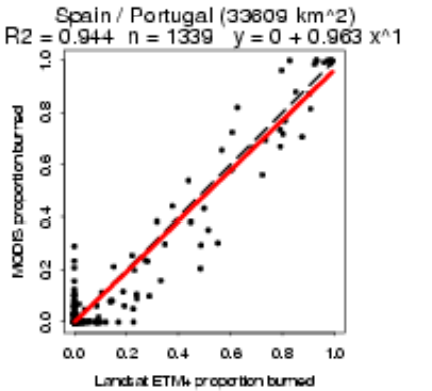
Regional Validations

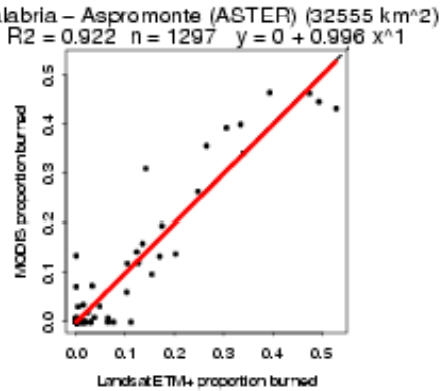


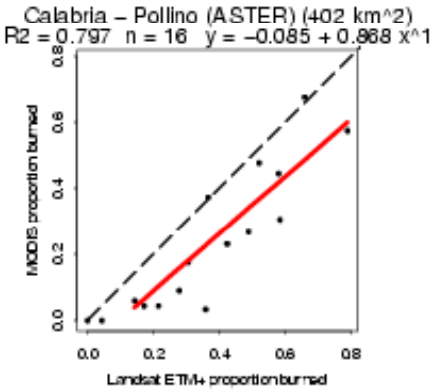












2003 VALIDATION: L3JRC
REGRESSION OVER 5KM X 5KM CELLS

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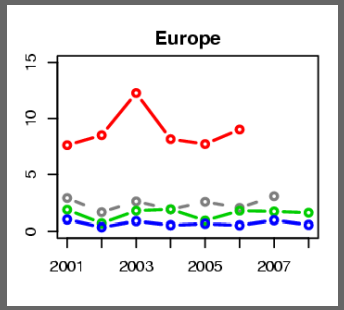
Intercomparisons

- L3JRC performs very well on MODIS Europe validation dataset.
- Intercomparison: Giglio et al 2010, shows that L3JRC detects more than MCD45, GFED 2 and GFED 3 in Europe



- Is the Stage 2 dataset enough to conclude that L3JRC has the right estimate?

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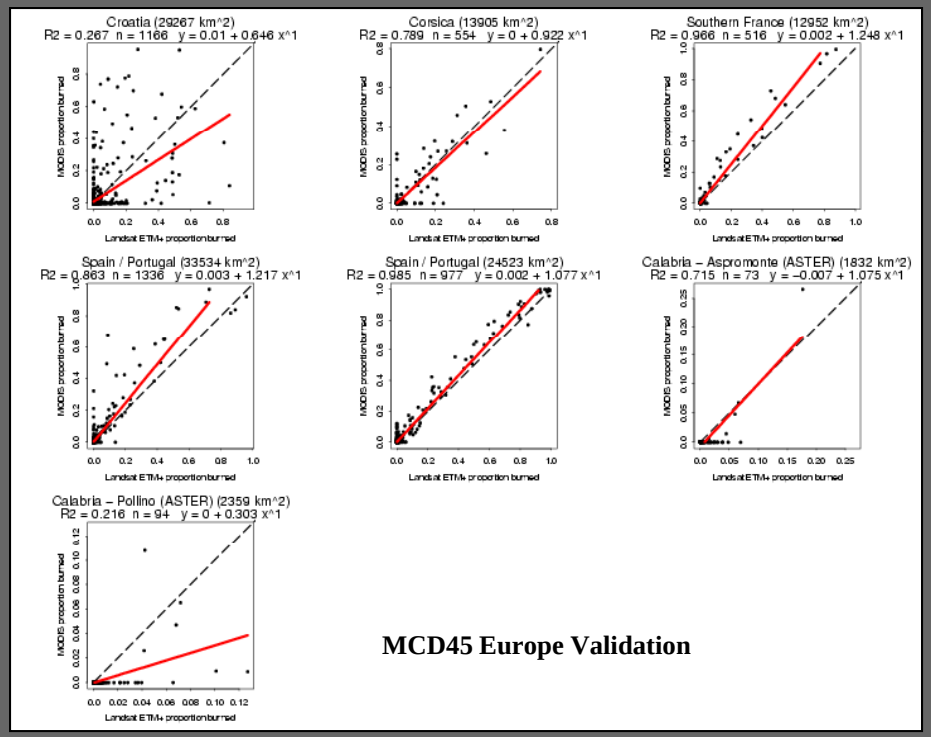
Intercomparisons

- But, MCD45 also performs well on Stage 2 dataset!



- Stage 3 needed to characterize fully the variability! (sampling in space and time)

Protocol Development

- Part I - Production and standardization of validation reference data (now available).
- Part II - Accuracy measures
- Part III - Format standardisation and metadata

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Part 1

- Generation of validation-quality reference data (i.e. Good enough to be an approximation of reality):
  - Landsat based
  - Visual interpetation of changes between two dates
  - Two advantages: unambiguous mapping, and reference time interval for each location, needed for multitemporal products
  - Distinction between ‘unmapped’ and ‘unburned’

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Parts 2 and 3

- Part 2: summary of commonly used measures which provide information to broad categories of users of products
  - Pixel level accuracy metrics from error matrix
  - Precision and accuracy on coarse resolution grids
- Part 3: standardization of format and metadata for future repository of validation data

Examples: Time difference between the two images

Image 1: 23 Oct 2000

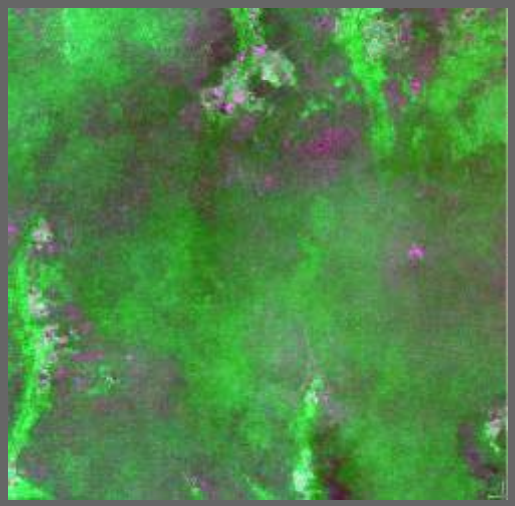
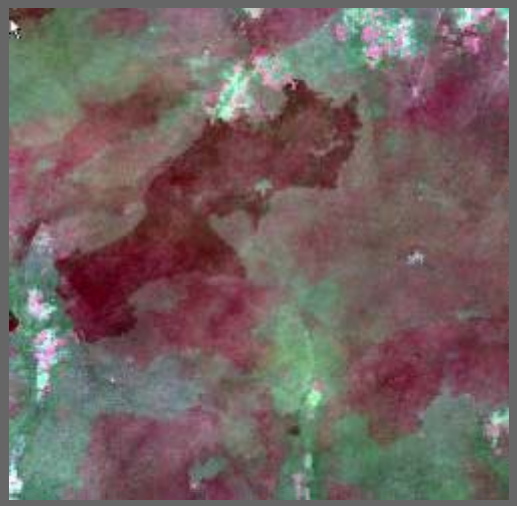


Image 2: 11 Jan 2001



INCORRECT: Images too far apart, the time interval is longer than the persistence time of the burned area spectral signal, and some burned areas in image 2 cannot be reliably identified

Image 1: 3 Sept 2001

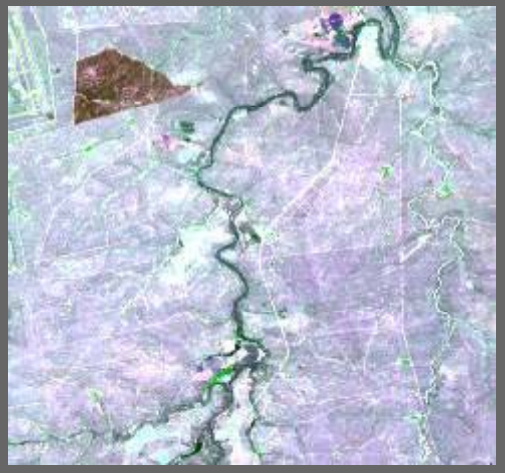


Image 2: 5 Oct 2001

CORRECT: the time interval is shorter than the persistence time of the burned area spectral signal, and all the areas burning between the 2 dates are clearly identifiable

Examples: Mapping the changes

Image 1: 10 Sept 2001

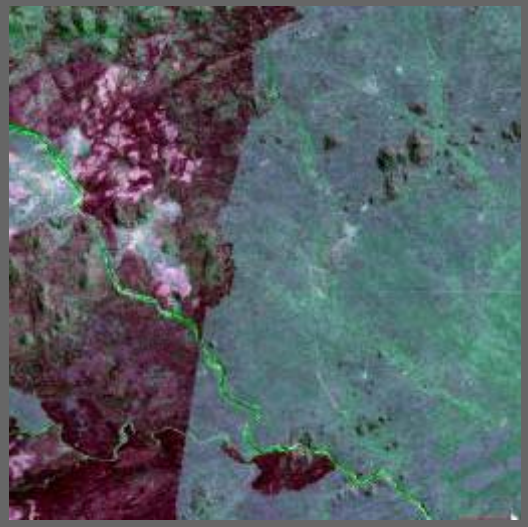
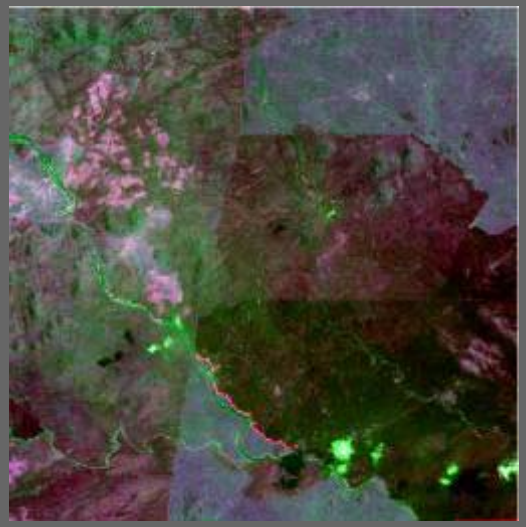


Image 2:12 Oct 2001



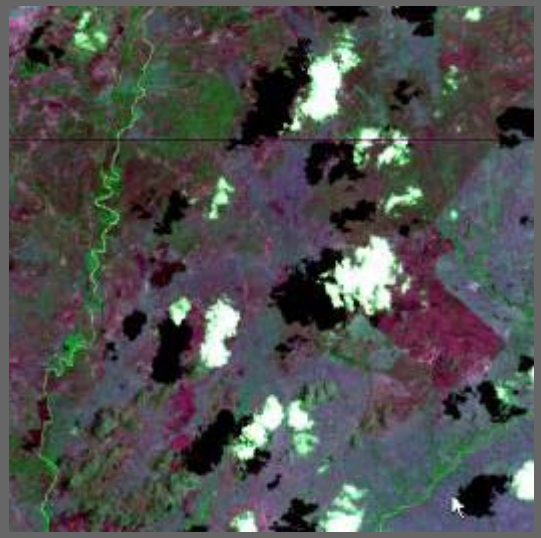
Interpretation

Only the portion of the burned area which burns between the two dates is digitised as burned (**red**), while the areas already burned in the first image are considered unburned (**black**)

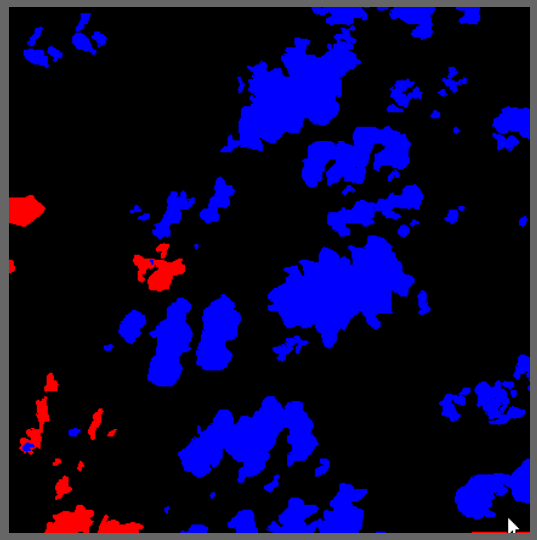
Examples: Mapping the changes

Image 1: 10 Sept 2001

Image 2:12 Oct 2001



Interpretation



Clouds and cloud shadows that make the interpretation impossible on either image must be digitised and labeled as unmapped (blue) rather than unburned (Black)

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Next steps

- A database of verified validation data needs to be established that is:
  - Representative of the different vegetated systems that are burned, not by country
  - Mix of fire intensities
- Any product **qualifying for ECV status** (probably a discussion item) will have to validate their product with this data
- This will be done by the developer and also independently by GOFC-GOLD
- Part IV: Research needed for sampling!

Information

- LPV Wiki
  - http://lpvs.pbwiki.com/
- http://lpvs.gsfc.nasa.gov/fire_background.html
- Next meeting of CEOS LPV possibly at ISRSE 2011, Sydney Australia, April 10-15

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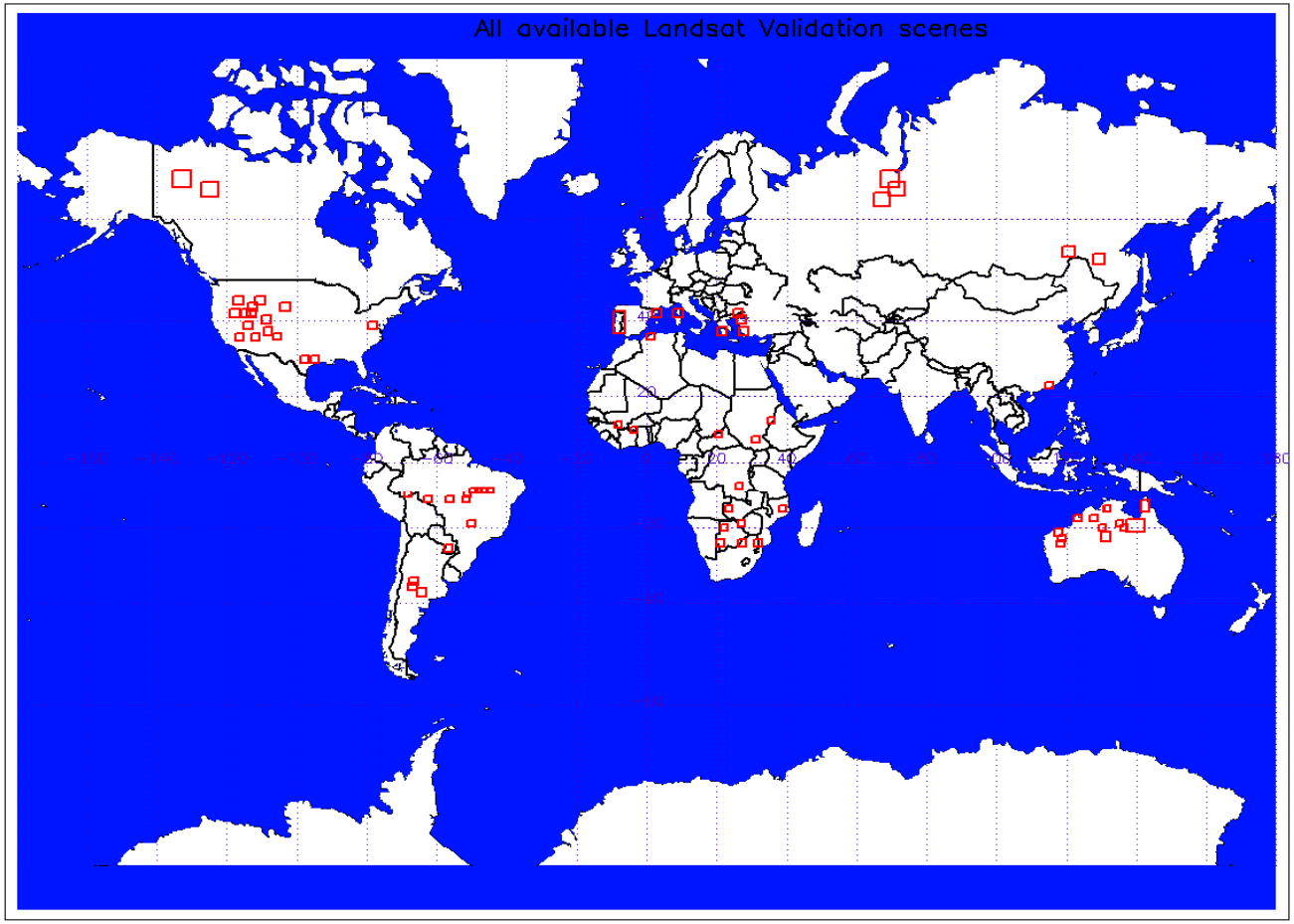
Coverage



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Next steps

- Agricultural fires of various sizes and under different crop types
  - Kazakhstan
  - Kansas
  - South America

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Next steps

- Grassland fires under different climate settings
  - Seasonally inundated grasslands (Colombia)
  - Woodland savannas (sub-Saharan Africa)
  - Temperate grasslands (Mongolia)
  - Tundra (Alaska)

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Next steps

- Boreal and temperate forest
  - Canada, Russia, China, Sweden, USA
- Mediterranean Forest
  - Spain, Italy, Portugal, Greece
- Tropical forest
  - Indonesia, Australia, Brazil, Congo

Next Steps

- Acquire, process and archive validation data
  - Who will host this archive
  - ESA CCI PI
  - CEOS LPV
- Build a web-based (or stand-alone) validation tool and user manual

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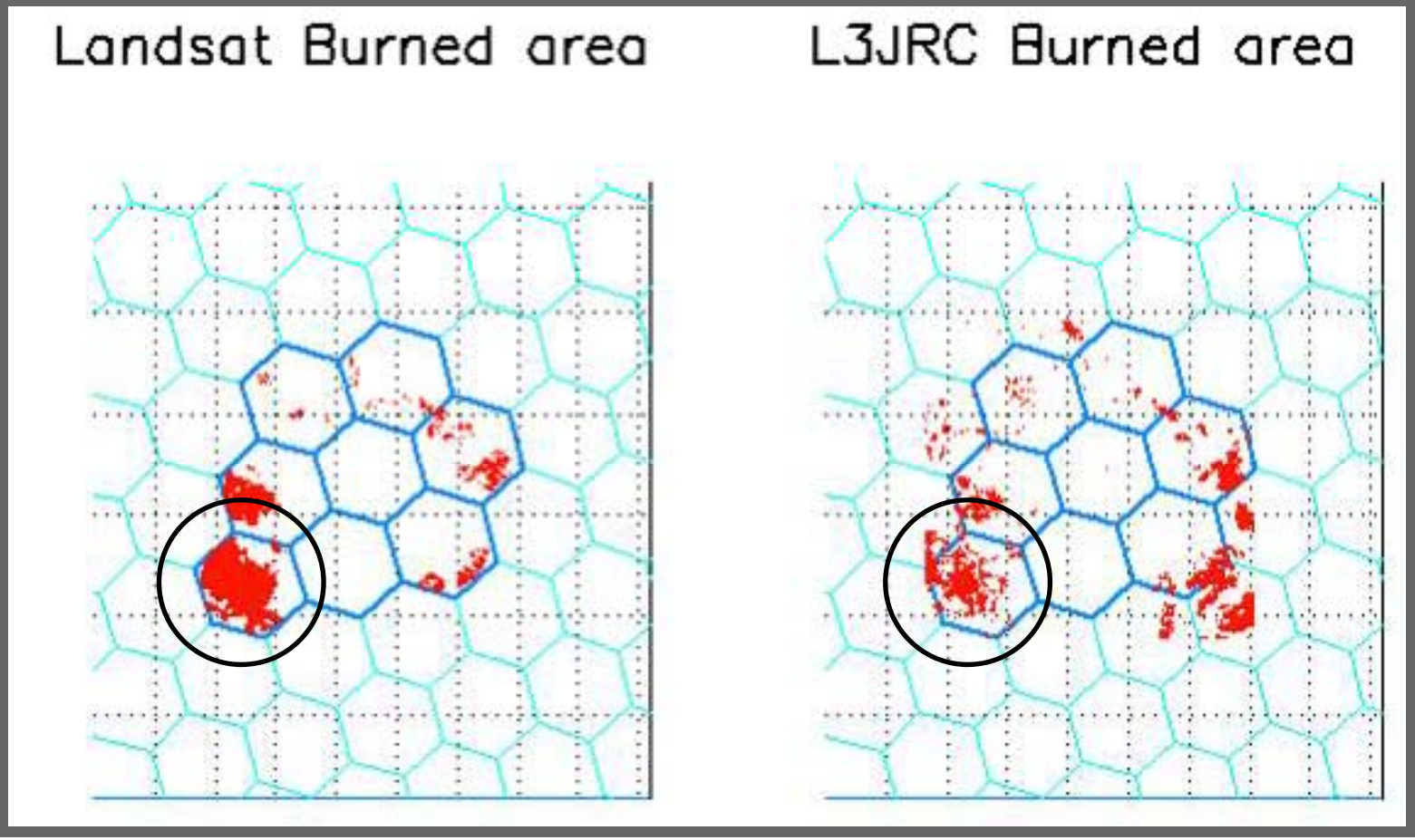
Metrics

- Location and area of individual scars
- Proportion of area burned over 5x5 km



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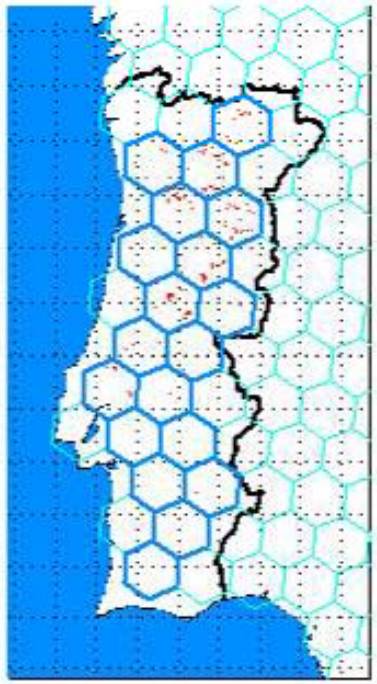
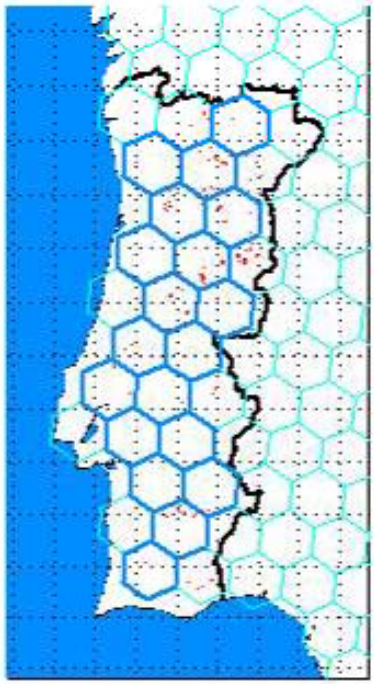
Vegetation type

- The performance of the algorithm in different vegetation cover types

Landsat Burned area



L3JRC Burned area



GLC2000 class