Fire_cci legacy

Emilio Chuvieco, University of Alcalá
On behalf of the Fire_cci consortium
What was the Burned Area landscape in 2010?

- USA:
  - Standard: MODIS-based BA product (MCD45): 500 m resolution, monthly pixel files.
  - Alternative: MODIS HS product (MCD64), to ingest the Global Fire Emissions Database (GFED), 15-day grid tiles.

- EU:
  - Different BA products (L3JRC, Globscar, Globcarbon), not consistent and not very accurate.

- Both:
  - Global BA products not statistically validated.
  - Weak connections to climate modelers.
  - Some coordination through the GOFC-GOLD Fire IT.
Performance of EU BA precursor products

Globcarbon $r^2 = 0.595$

L3JRC $r^2 = 0.128$

MCD45 $r^2 = 0.746$


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Performance of EU BA precursor products

Giglio et al., 2010

Comparing to fire perimeters
What is the Burned Area landscape in 2016? (2 years left)

**USA:**
- Future merging of both MODIS-based BA product (MCD45 and MCD64).
- Movement towards Landsat-based products.
- Global validation not yet undertaken.

**EU:**
- Climate assessment: fire shapes and fire emissions.
- Small fire database based on Sentinel-2/1 (in progress).
- Strong connections to climate modellers: cross-ECV collaborations.
Product intercomparison

Fire_cci

GFED4
### Regional differences

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Area (km²)</th>
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<tbody>
<tr>
<td>Fire cci4.1</td>
<td>45k</td>
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<tr>
<td>GFED4s</td>
<td>84k</td>
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<td>MCD45</td>
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<td>GFAS</td>
<td>71 PJ [bar: T/° per 0.5°]</td>
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Temporal trends
GFED 4 – GFED4s – Fire_cci4.1

Month_Year

0 100,000 200,000 300,000 400,000 500,000 600,000 700,000 800,000 900,000

Monthly BA (km²)

GFED4s
GFED4
Fire_cci 4.1

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• 242 pairs of Landsat TM/ETM+ images.
• 130 sites for spatial validation from 2008 (red)
• 112 pairs for temporal validation (blue).
Temporal series for validation

### Reference Data

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**Legend**
- **Burned area**
- **No data**
- **Unburned**
### Global accuracy (2008)

#### Accuracy metrics (Standard error)

<table>
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<tr>
<th>Product</th>
<th>OA(%)</th>
<th>Ce(%)</th>
<th>Oe(%)</th>
<th>DC(%)</th>
<th>B (%)</th>
<th>relB(%)</th>
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<tr>
<td>a MCD64</td>
<td>99.6 (0.1)</td>
<td>42 (4)</td>
<td>68 (4)</td>
<td>42 (4)</td>
<td>-0.17 (0.05)</td>
<td>-44 (7)</td>
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<tr>
<td>b MCD45</td>
<td>99.7 (0.1)</td>
<td>46 (4)</td>
<td>72 (5)</td>
<td>37 (4)</td>
<td>-0.17 (0.05)</td>
<td>-48 (8)</td>
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<tr>
<td>c Geoland2</td>
<td>99.6 (0.1)</td>
<td>74 (9)</td>
<td>91 (4)</td>
<td>13 (5)</td>
<td>-0.23 (0.07)</td>
<td>-68 (9)</td>
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<tr>
<td>d Fire_cci</td>
<td>99.6 (0.1)</td>
<td>64 (6)</td>
<td>76 (5)</td>
<td>29 (5)</td>
<td>-0.12 (0.04)</td>
<td>-34 (12)</td>
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#### Comparison with fire perimeters for selected sites

- **Australia:** CE = 0.22; OE = 0.38
- **Canada:** CE = 0.12; OE = 0.43
- **California:** CE = 0.22; OE = 0.28

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Padilla et al., 2015

7th CCI Collocation, October 2016
Fire patch analysis v3.1

Chuvieco et al., 2016, GEB
### Emission comparisons

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<tr>
<th></th>
<th>Burned area (Mha yr(^{-1}))</th>
<th>CO emissions (TgCO yr(^{-1}))</th>
<th>Carbon emissions (PgC yr(^{-1}))</th>
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<td>ORCHIDEE – Fire_cci 3.1</td>
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<td>GFED3.1 data set</td>
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<td>334</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Chuvieco et al., 2016, GEB
• Version 3.1:
  o 65 researchers from 28 countries (+ESA, JRC, FAO).
• Version 4.1 (available since July, 2016):
  o 35 researchers from 18 countries.
What actions have promoted the change?

- Collaboration amongst the leading fire experts (EU and Int), both with RS and climate background.
Presentation to the international fire community

GOFC-GOLD Fire IT (October, 2011)
And to regional networks (Russia, Australia and Latin America)
What actions have promoted the change?

- Collaboration amongst the leading fire experts (EU and Int), both with RS and climate background.
- Sensor-oriented BA algorithms. Equilibrium between ambition and pragmatism.
- Strong emphasis on validation.
- Connection between ECVs at programmatic level:
  - Difficulties in objectives and language.
  - Emphasis on data generation versus data analysis.
  - Initiatives in progress: fire emissions – GHG; fire occurrence – LC; Soil Moisture – fire occurrence.
  - Potentials: fire emissions – aerosols; SST – fire occurrence.
Lessons learned

• Keep focus on final goals in terms of data processing.
• Burned area products require further research (less in data generation, more in data analysis).
• Invest on validation: reference sites and methods.
• Cooperation between RS experts and modellers: CRG + CMUG.
  o Cross-relation with other ECVs.

7th CCI Collocation, October 2016