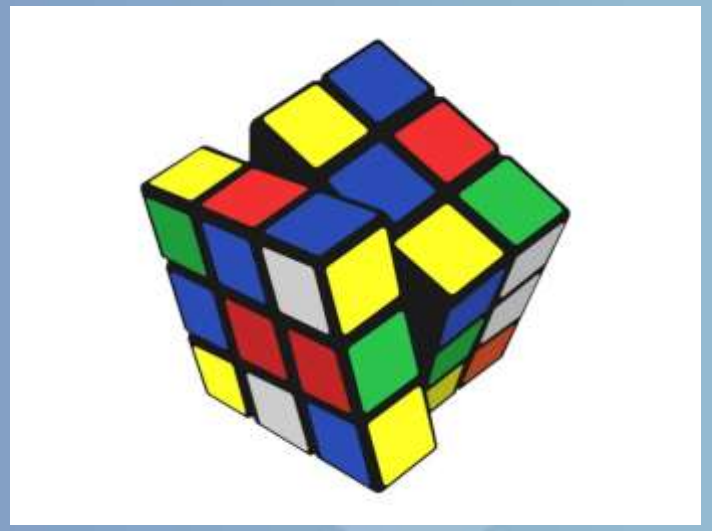
RAMI-V: Results Part -2



Christian Lanconelli, Nadine Gobron & Monica Robustelli
and RAMI-V participants

RAMI Workshop 2023

European Commission

Applying ISO-13528 to Canopy RT Models

- *Ensure the homogeneity and stability of the samples that are to be analyzed by the participants* → Participants do their best.
- *Assign a reference value against which the bias of the participants can be determined* → ISO-13528 recommends to use **consensus values derived either from the simulations of selected expert models** or else from the **participants of the proficiency test itself**.
- *Specify a tolerance criteria allowing to determine whether deviations from the reference are significant*.

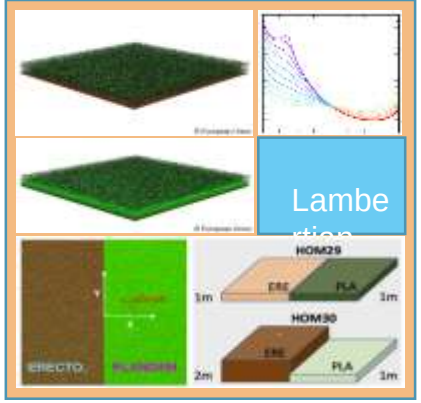
Widlowski J.-L., et. al. The fourth Radiation Transfer Model Intercomparison (RAMI-IV): Proficiency Testing of Canopy Reflectance Models with ISO-13528. (2013), Journal of Geophysical Research - Atmospheres, 118, D09111, 13, DOI: 10.1002/jgrd.50497.

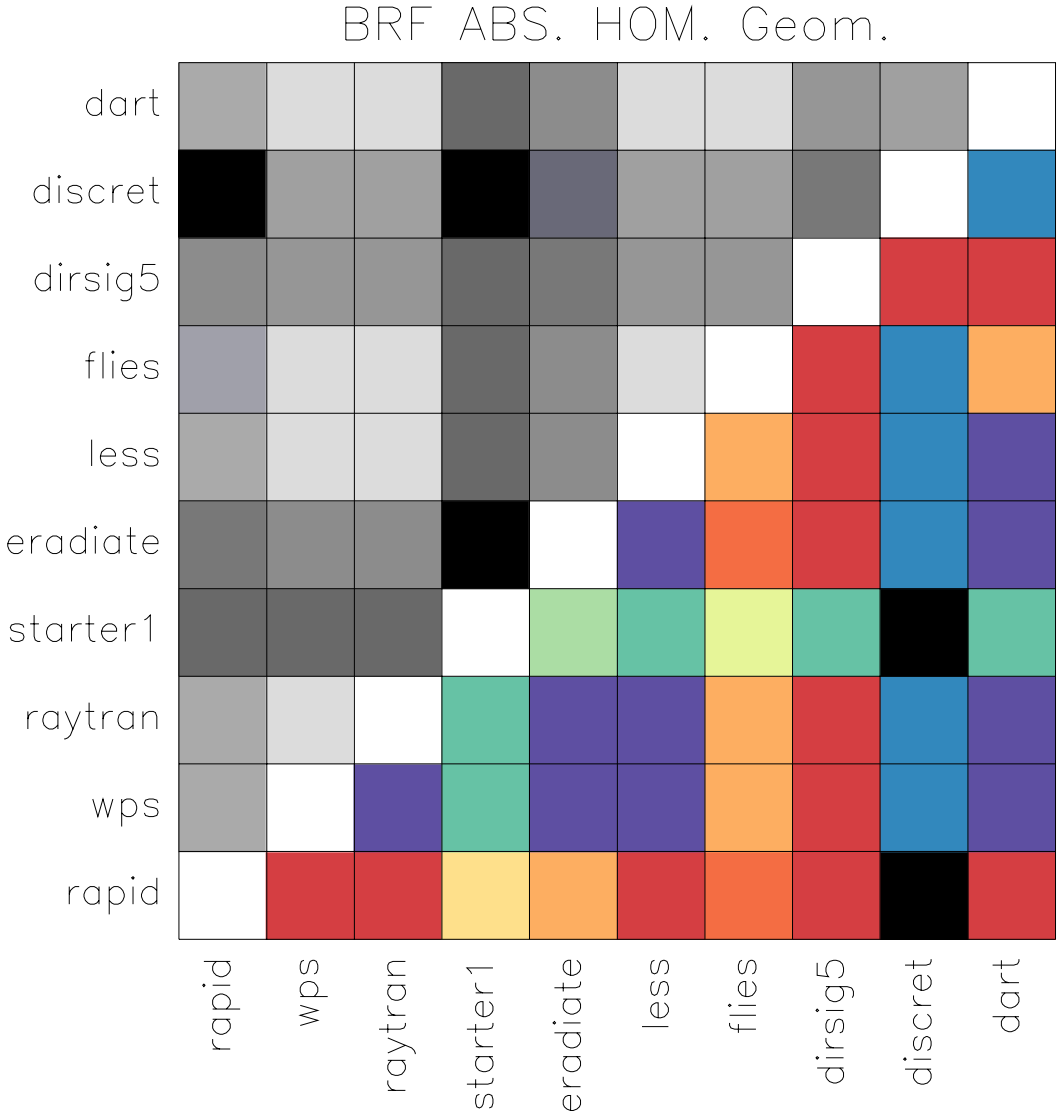
Homogeneous Abstracts Results

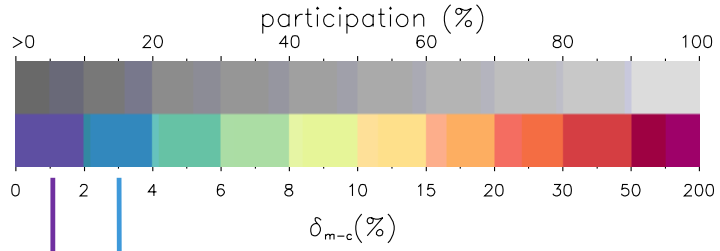
Homogeneous
Anisotropic Background
(HOM23,24,25/HOM33,34,35)

Two-layer canopy
(HOM26,27,28/HOM36,37,38)

Adjacent canopies
(HOM29,HOM30)







dart
eradiate
less
raytran
wps

starter1

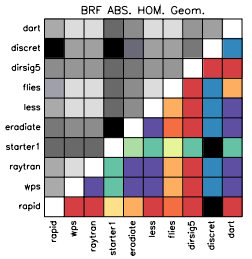
dirsig5
flies
rapid

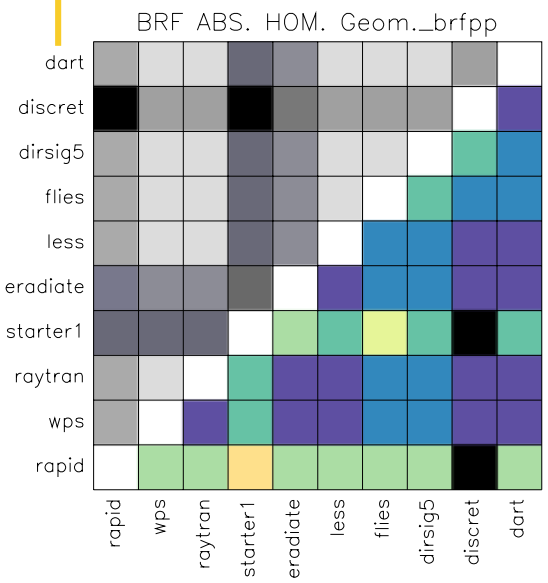
discret

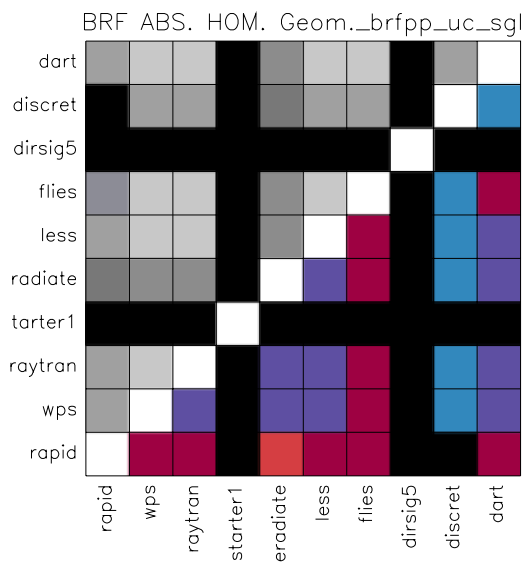
dart
flies
less
raytran
wps

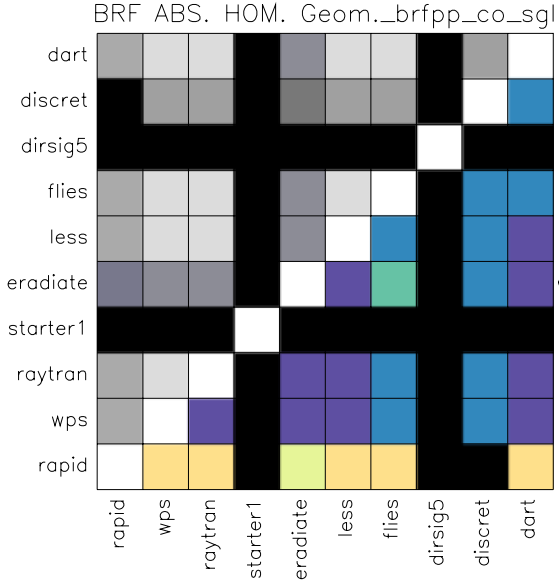
European Commission

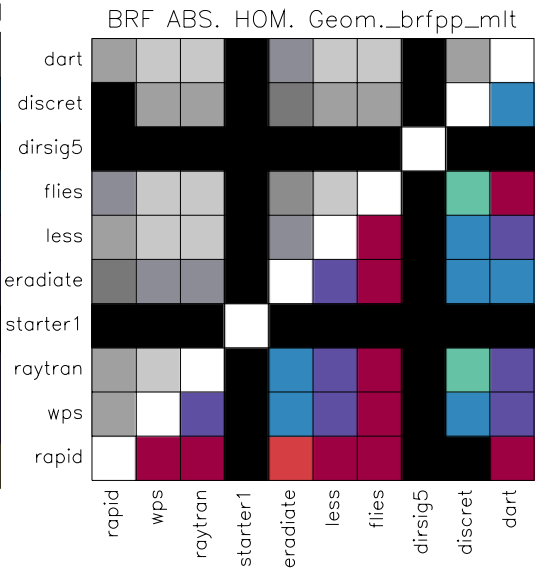
Homogeneous Abstracts Results - @meas

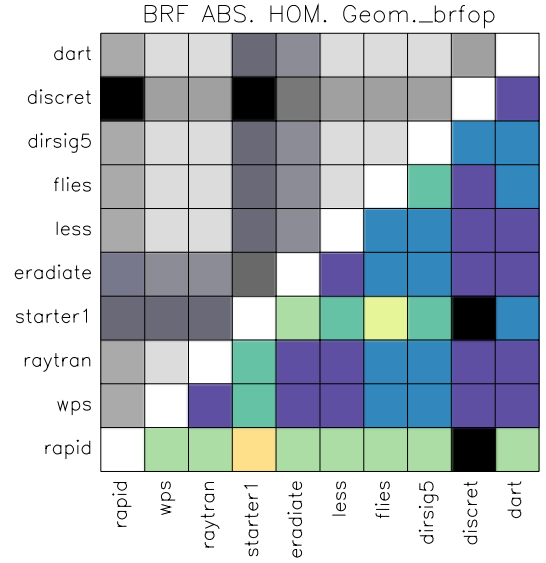


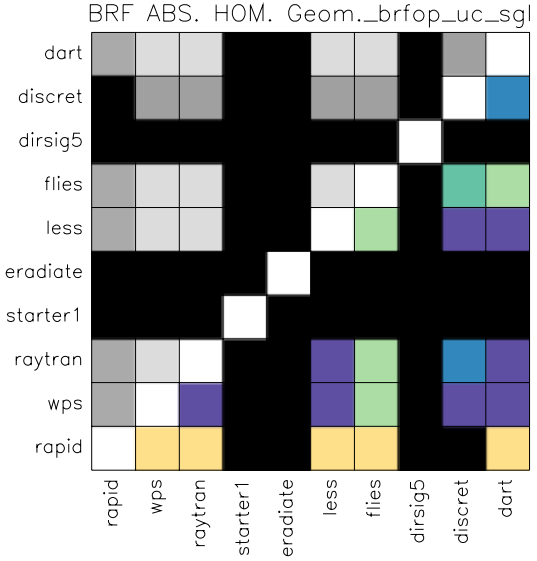


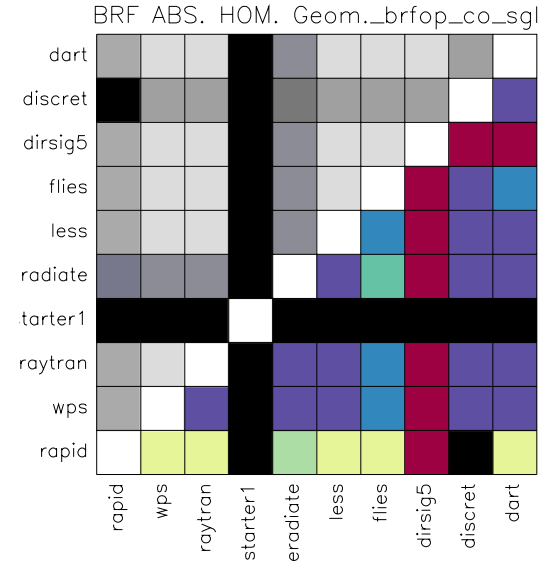


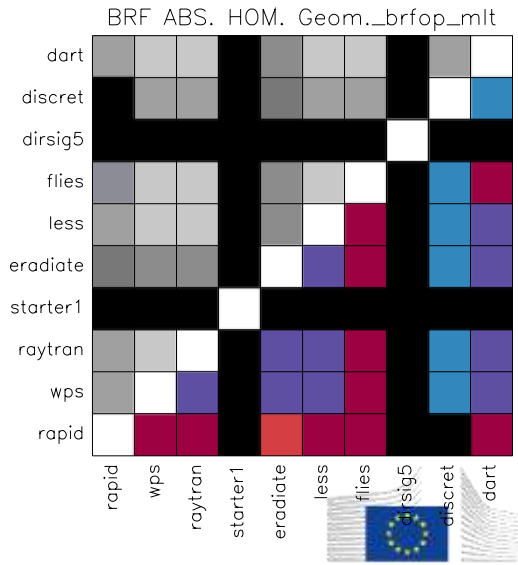


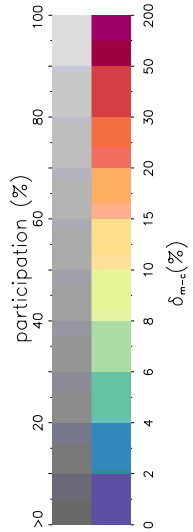












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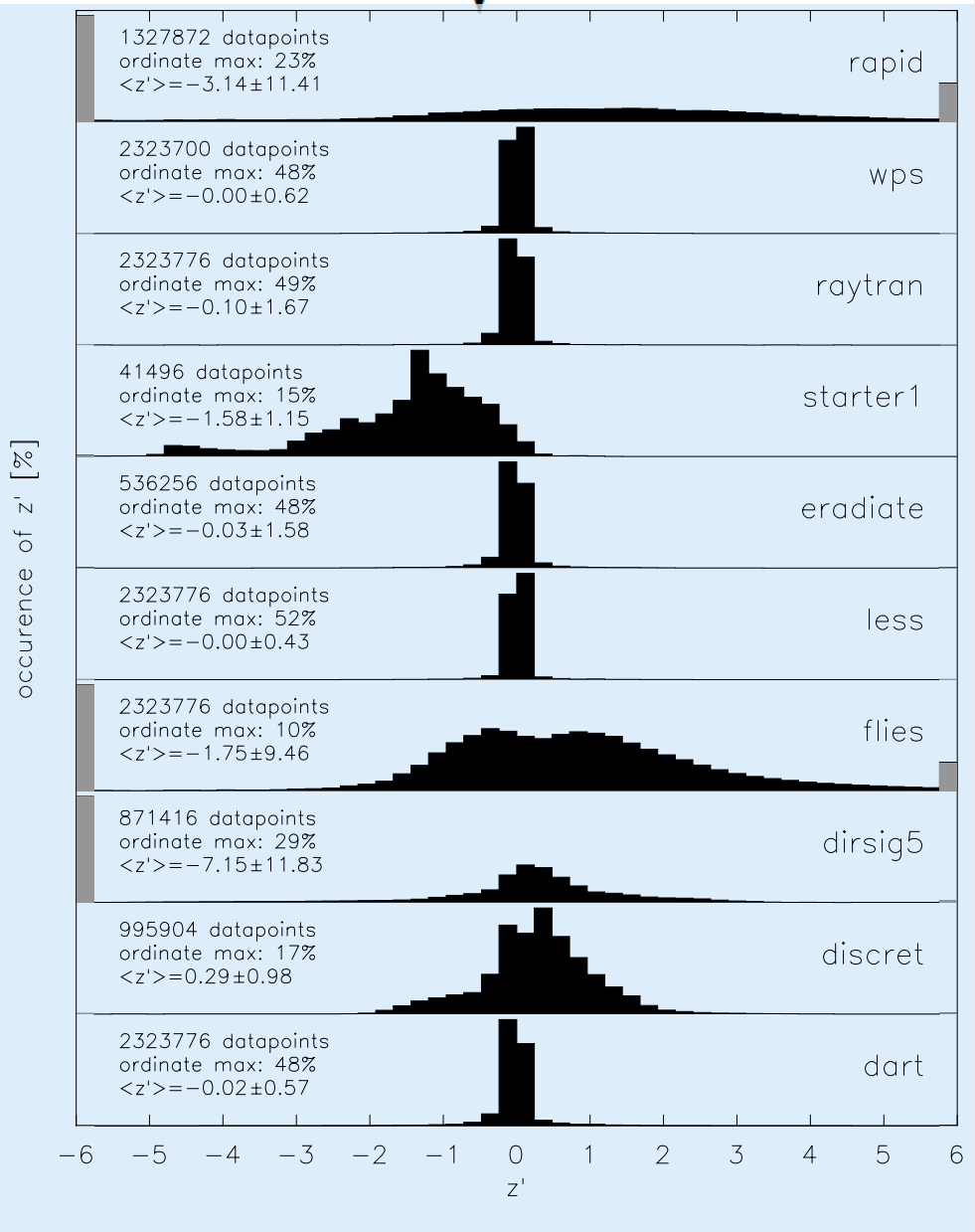
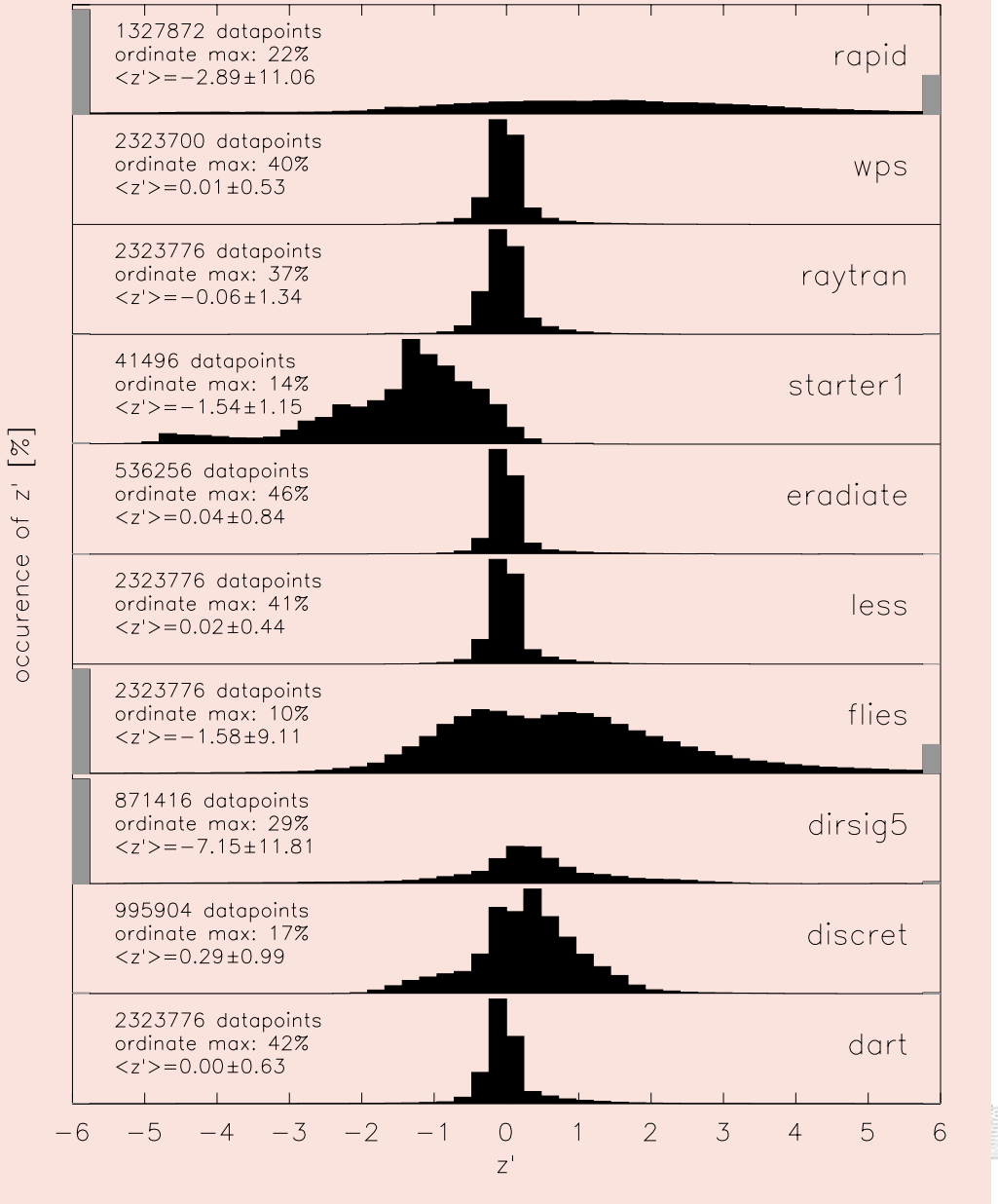
$$z'(m;\lambda,\zeta,\Omega_v,\Omega_i)=\frac{x_*^m(\lambda,\zeta,\Omega_v,\Omega_i)-X_*(\lambda,\zeta,\Omega_v,\Omega_i)}{\sqrt{\hat{\sigma}^2(\lambda,\zeta,\Omega_v,\Omega_i)+u_{X_*}^2(\lambda,\zeta,\Omega_v,\Omega_i)}}$$

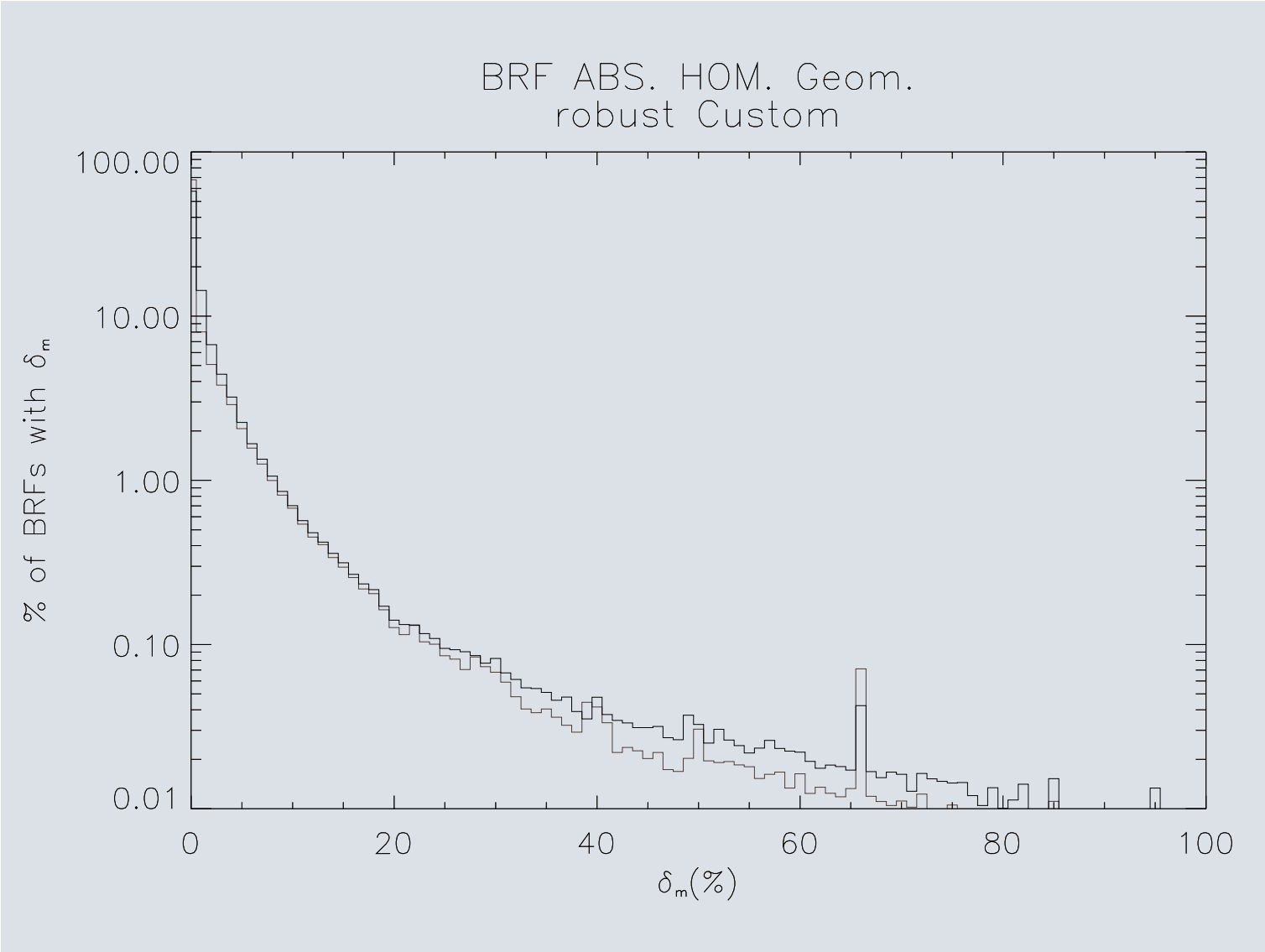
RMD: X* = All models - m

dart
less
raytran
wps





Histogram Overall z'



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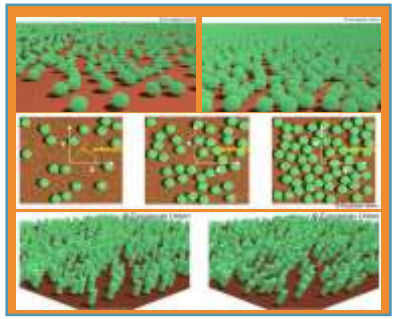
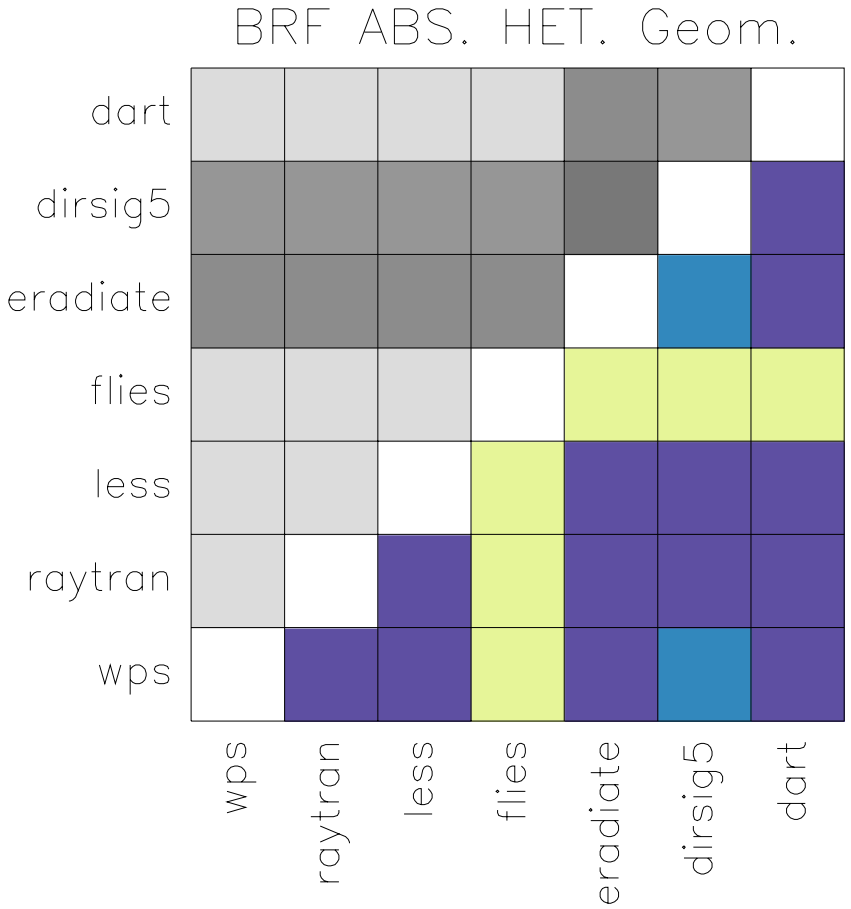
Heterogeneous Abstract Results

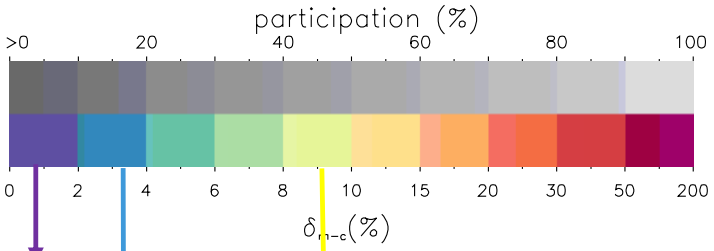


Heterogeneous
Anisotropic background
(HET10,11,12/HET20,21,22)

Two-layer canopy
(HET16,17,18/HET26,27,28)

Constant Slope
(HET23,24/HET33,34)





dart
eradiate
less
raytran
wps

dart
flies
less
raytran
wps

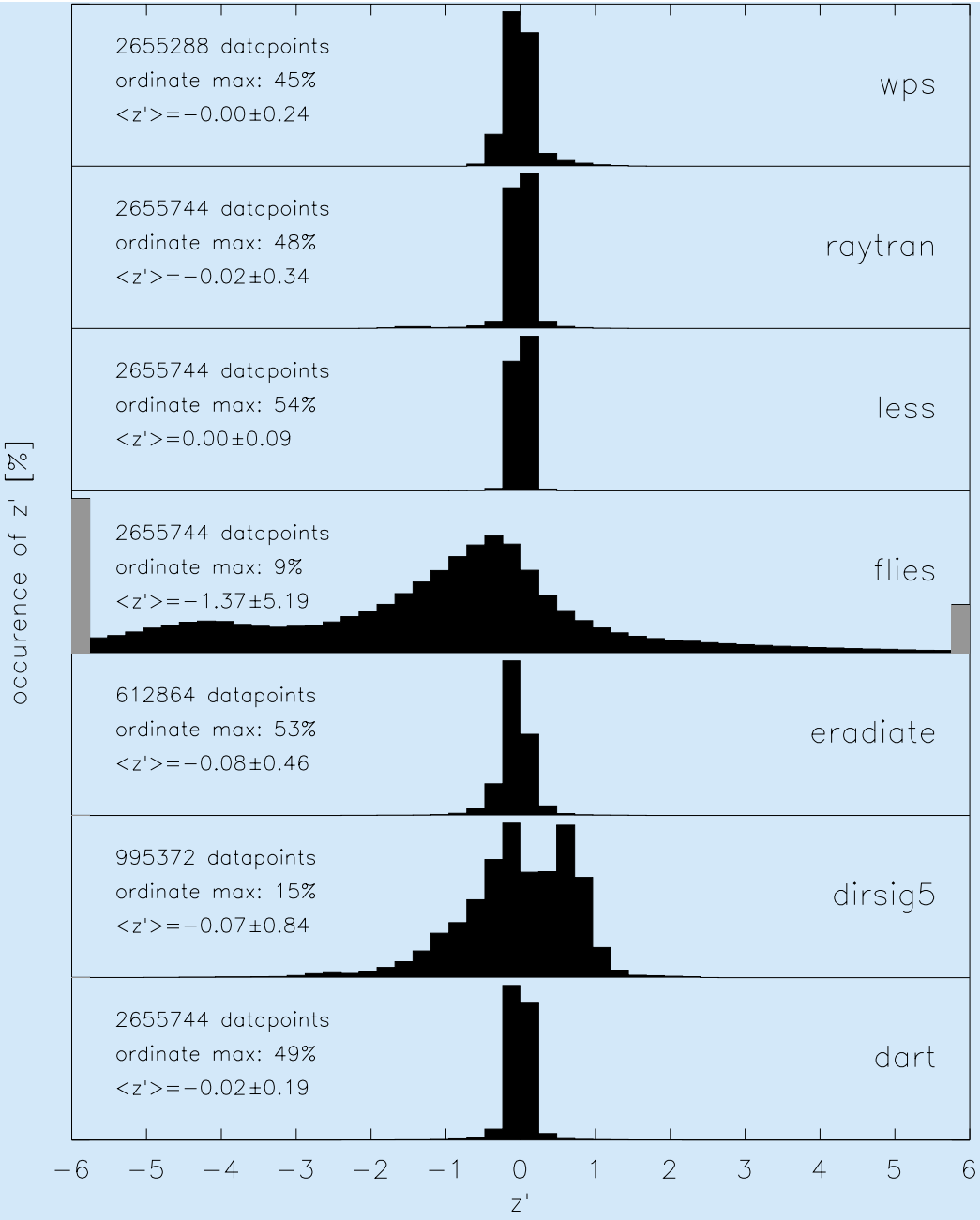
flies

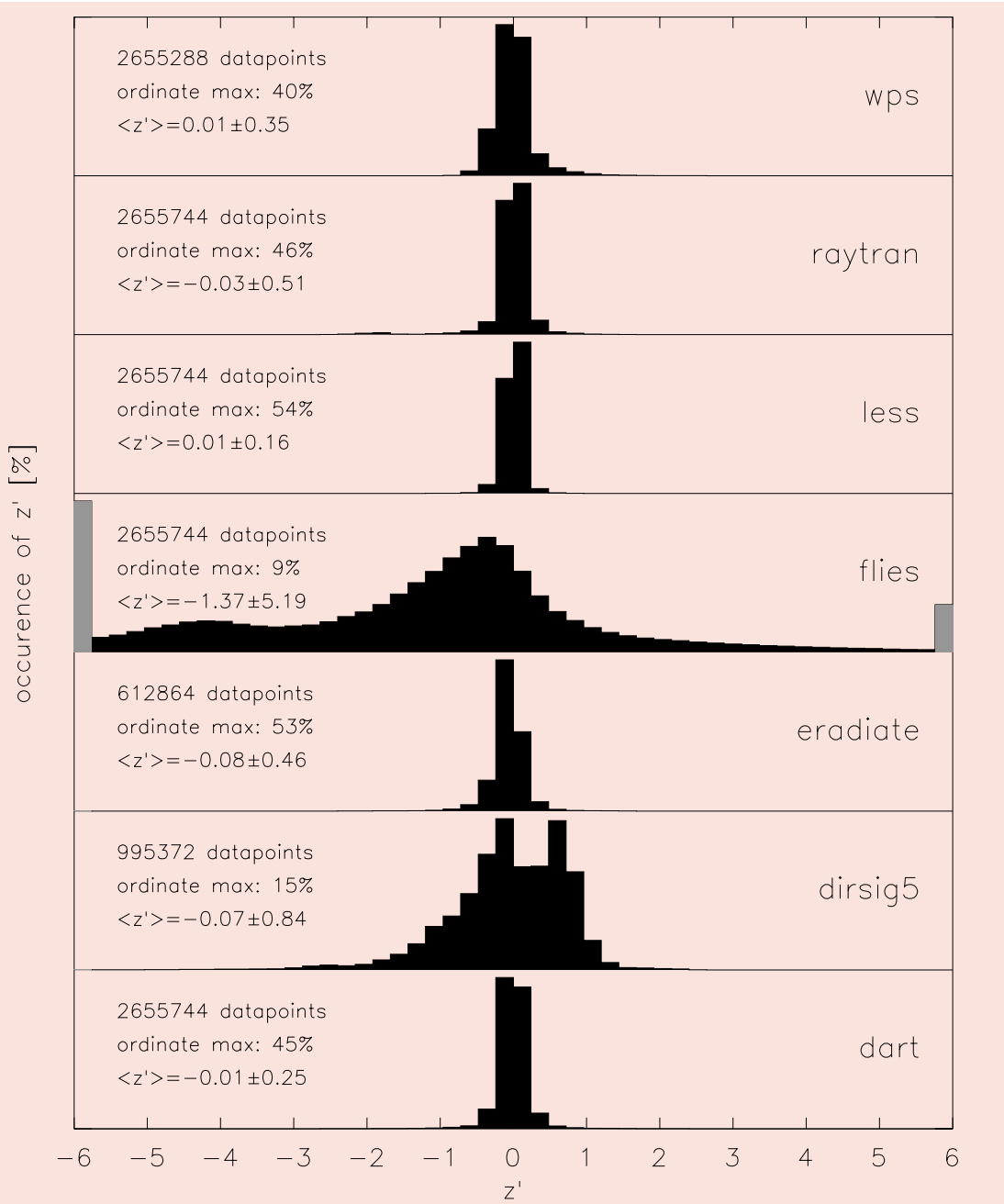
dirgit5

Ref = Custom

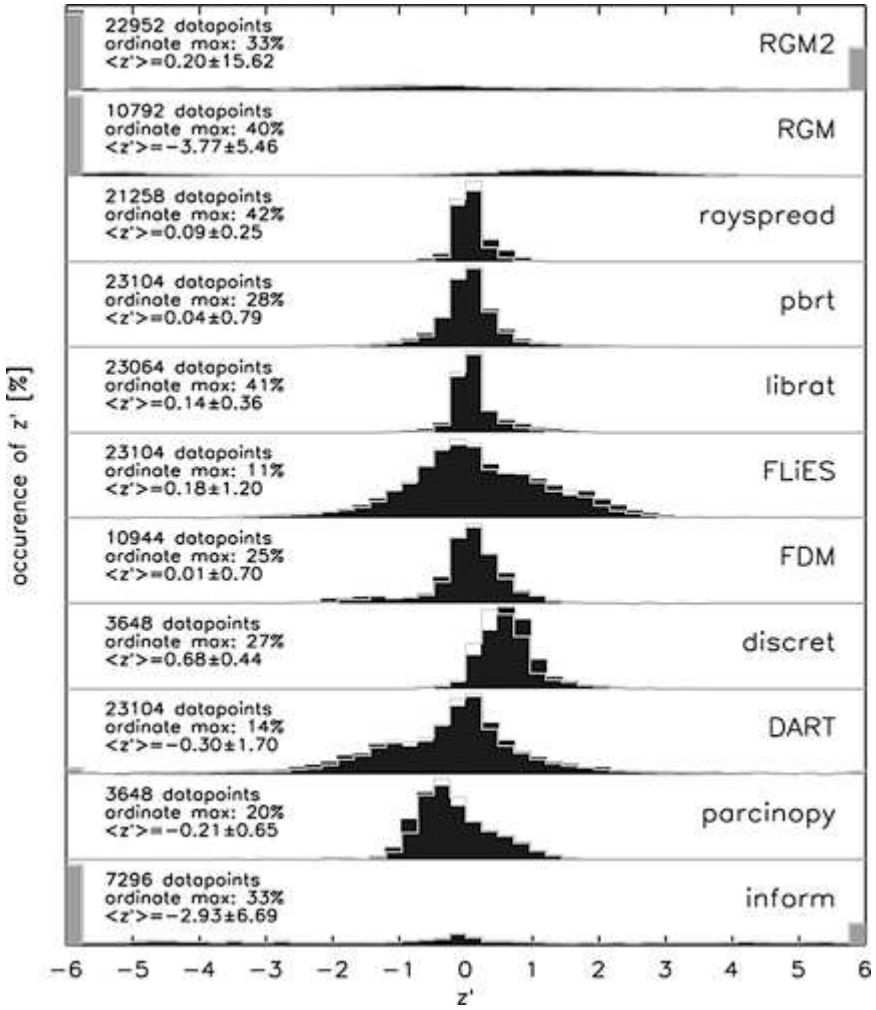
RMD: All models - flies

dart
less
raytran
wps

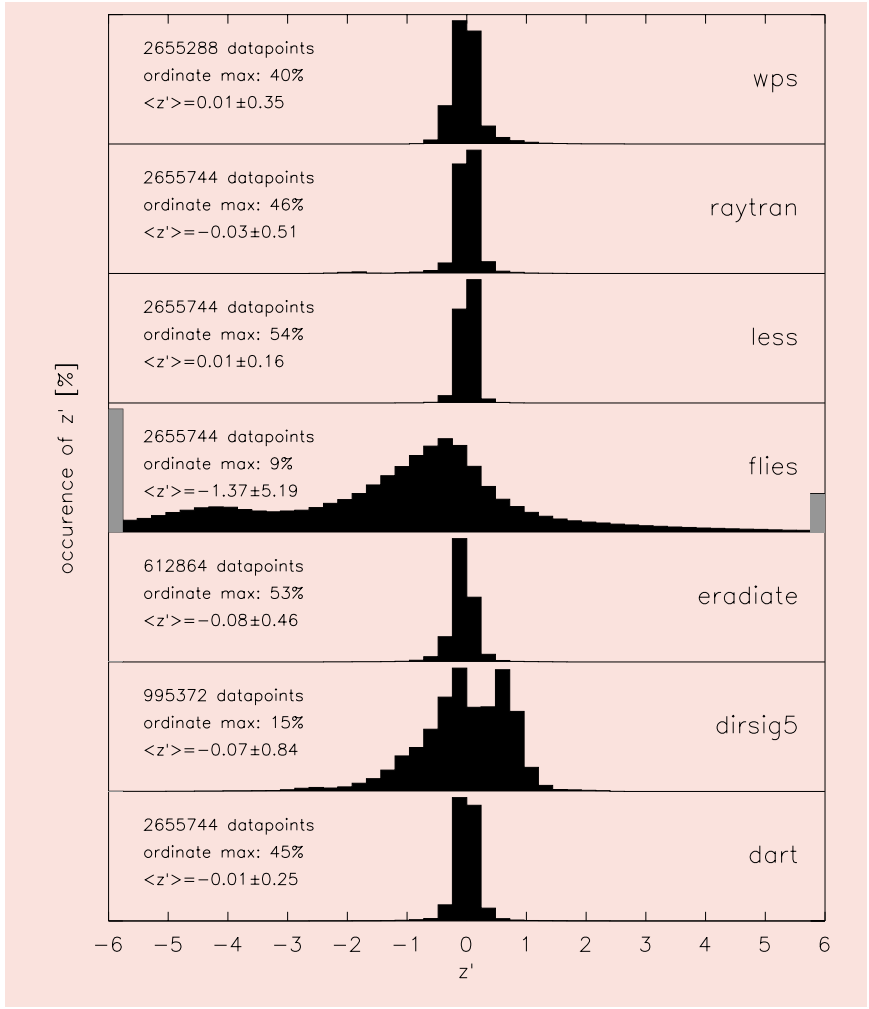




RAMI-4



RAMI-5



Widlowski J.-L., et. al. The fourth Radiation Transfer Model Intercomparison (RAMI-IV): Proficiency Testing of Canopy Reflectance Models with ISO-13528. (2013), Journal of Geophysical Research - Atmospheres, 118, D09111, 13, DOI: 10.1002/jgrd.50497.

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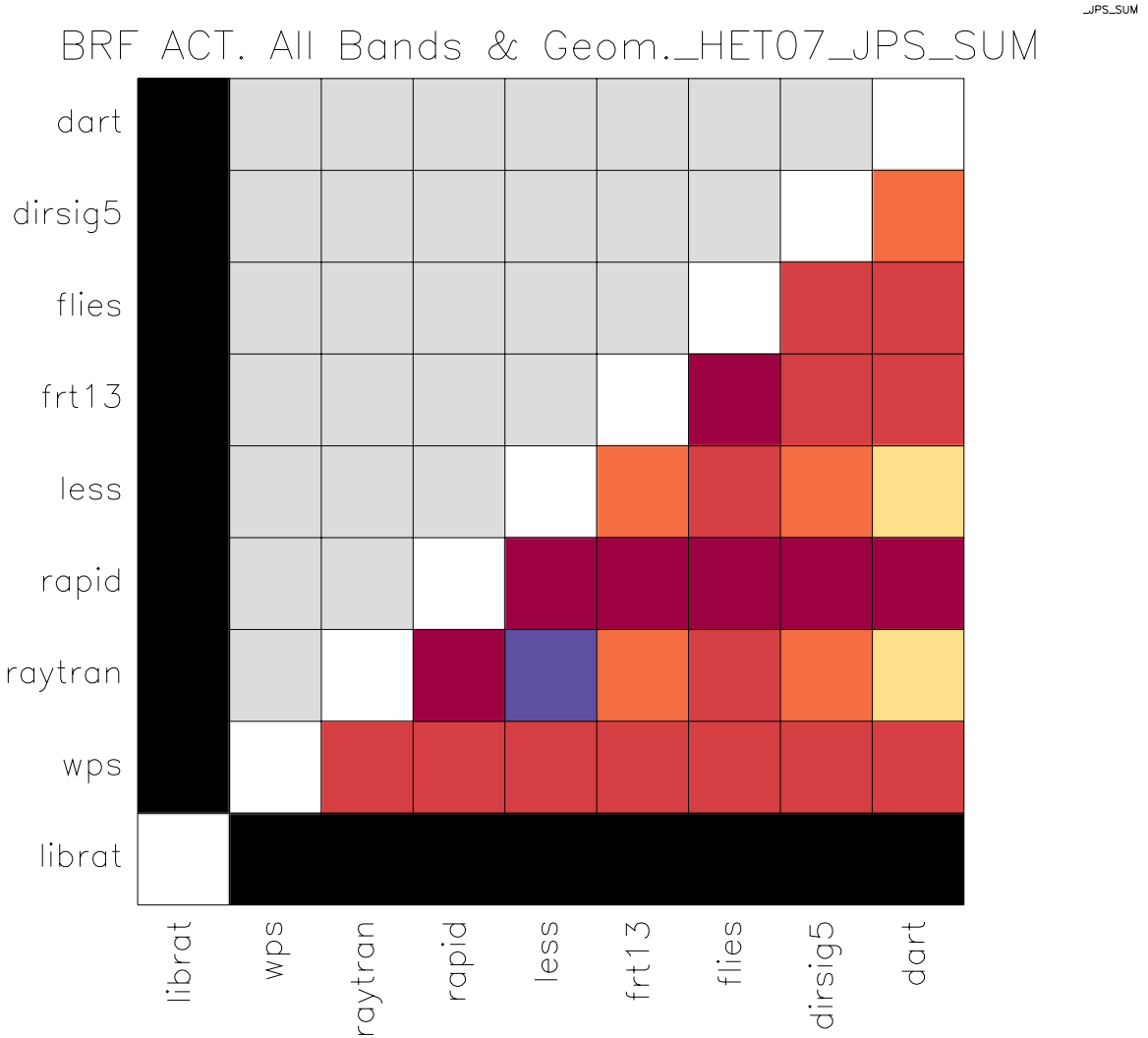
Actual … results for brfpp's corner

Järvselja Pine Stand (Summer) (HET07_JPS_SUM)

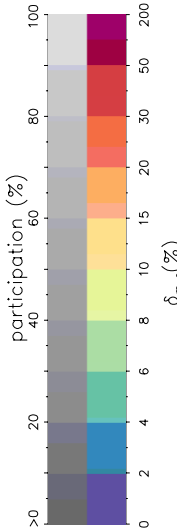
Järvselja Birch Stand (Summer) (HET09_JBS_SUM)

Järvselja Birch Stand (Winter) (HET15_JBS_WIN)

Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)



raytran & less < 2%



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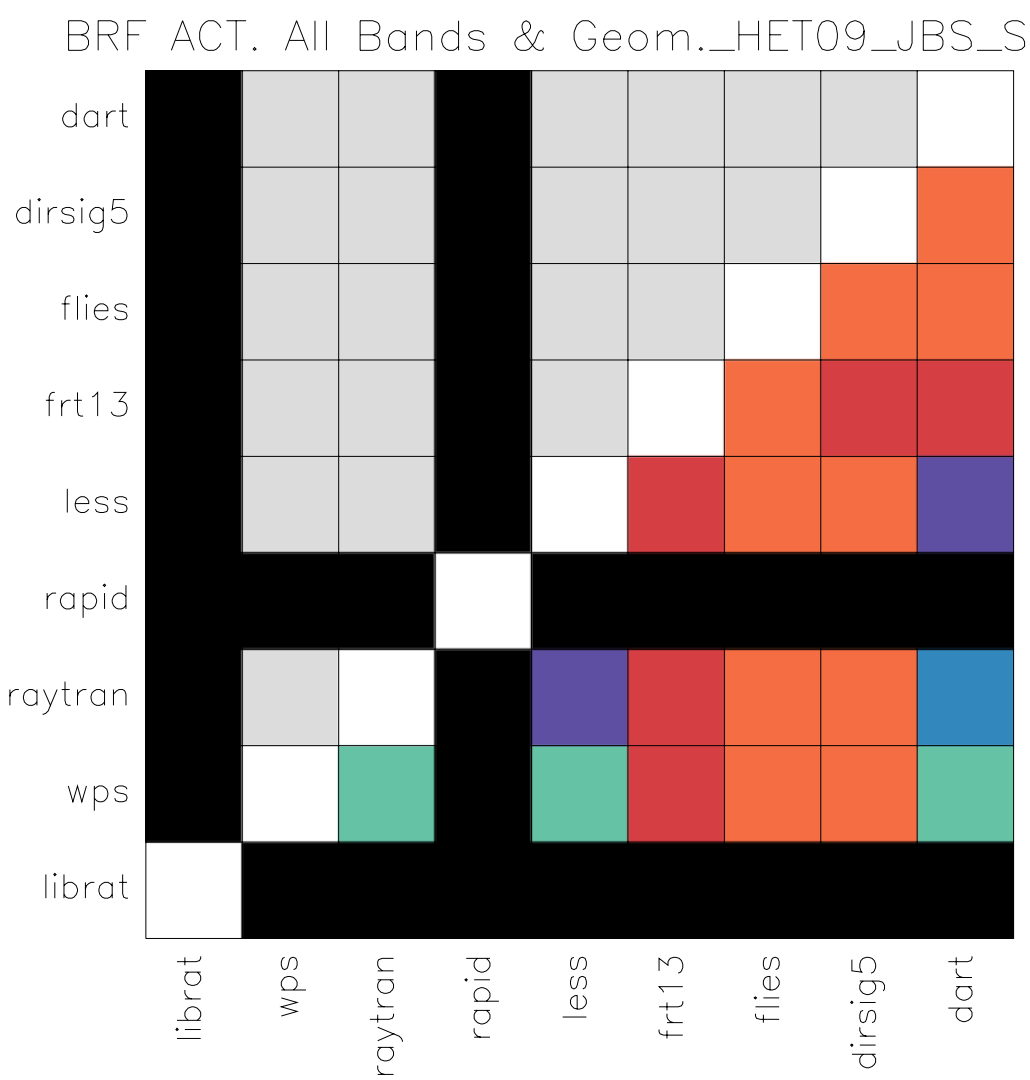
Actual Results

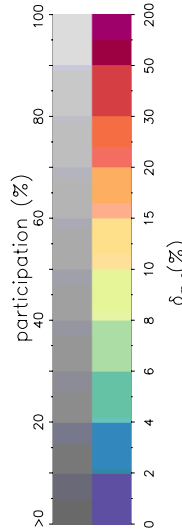
Järvselja Pine Stand (Summer) (HET07_JPS_SUM)

Järvselja Birch Stand (Summer) (HET09_JBS_SUM)

Järvselja Birch Stand (Winter) (HET15_JBS_WIN)

Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)





raytran & less < 2%

raytran & less, dart < 2 (4) %

European Commission

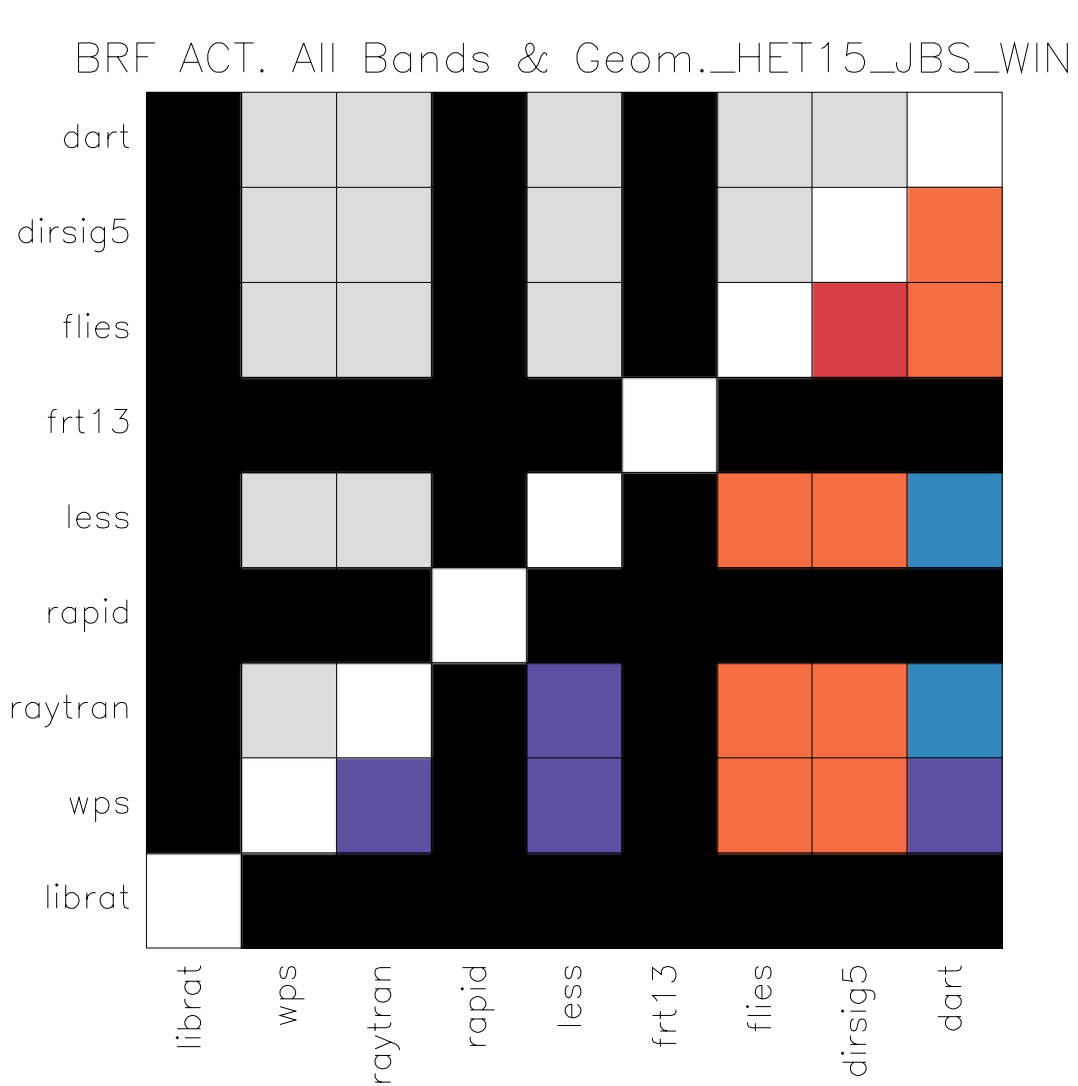
Actual Results

Järvselja Pine Stand (Summer) (HET07_JPS_SUM)

Järvselja Birch Stand (Summer) (HET09_JBS_SUM)

Järvselja Birch Stand (Winter) (HET15_JBS_WIN)

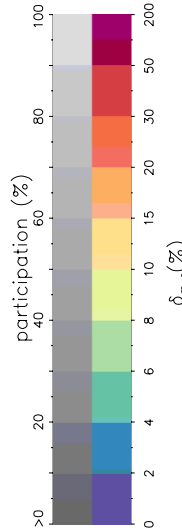
Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)



raytran & less < 2%

raytran & less, dart < 2 (4) %

raytran & less, dart < 2 (4) %



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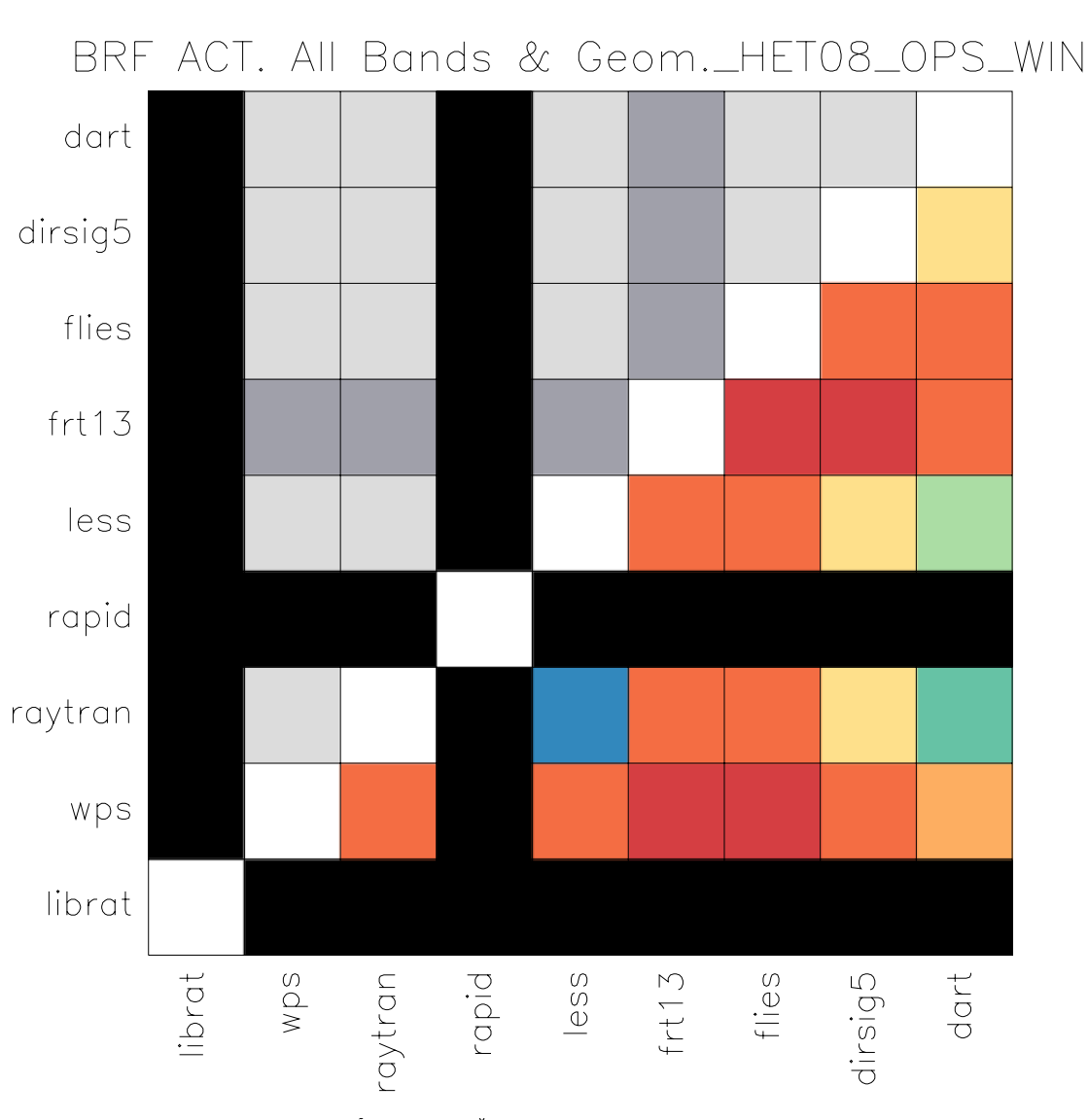
Actual Results

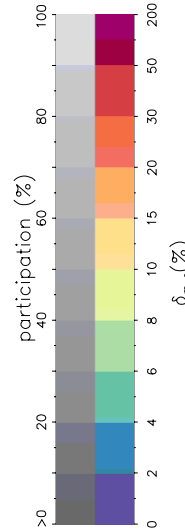
Järvselja Pine Stand (Summer) (HET07_JPS_SUM)

Järvselja Birch Stand (Summer) (HET09_JBS_SUM)

Järvselja Birch Stand (Winter) (HET15_JBS_WIN)

Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)





raytran & less < 2%

raytran & less, dart < 2 (4) %

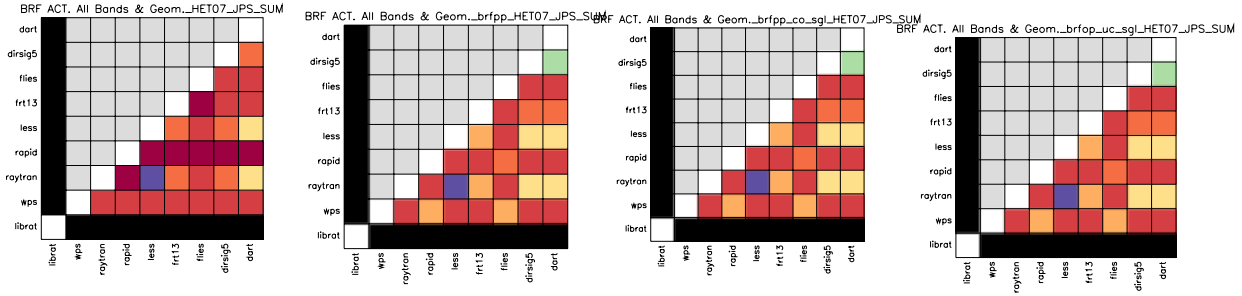
raytran & less, dart < 2 (4) %

raytran & less, dart < 2 (4) %

European Commission

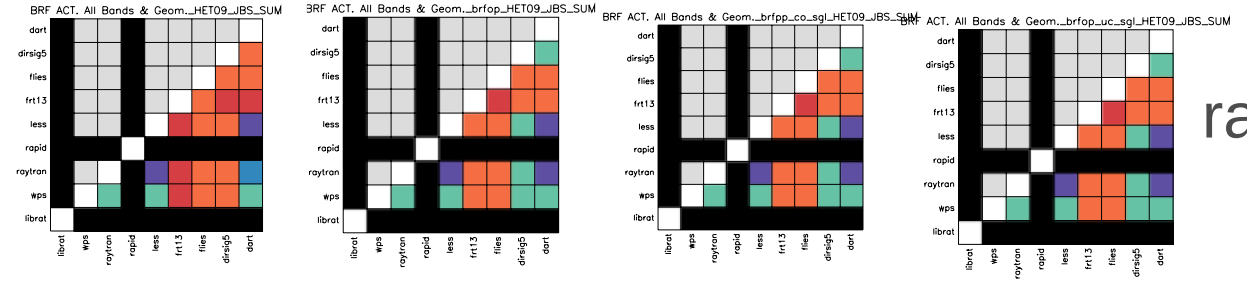
Actual Results

Järvselja Pine Stand (Summer) (HET07_JPS_SUM)



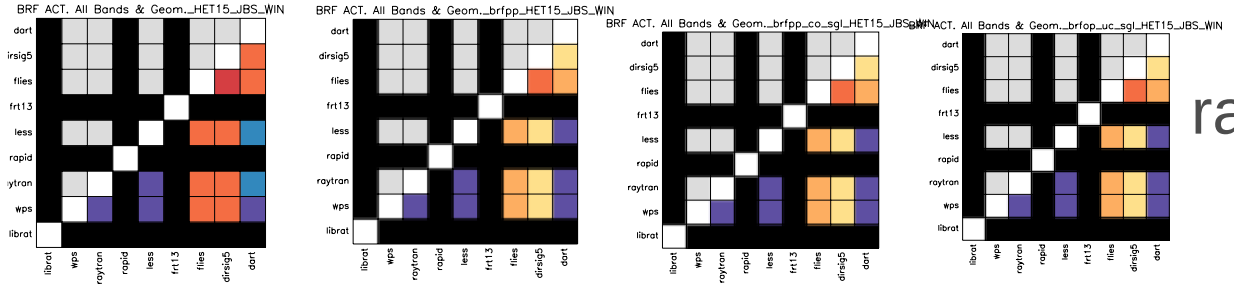
raytran & less < 2%

Järvselja Birch Stand (Summer) (HET09_JBS_SUM)



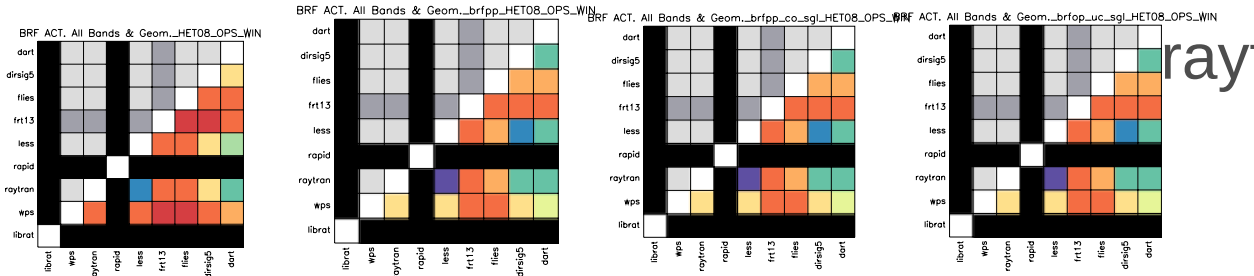
raytran & less, dart < 2 (4) %

Järvselja Birch Stand (Winter) (HET15_JBS_WIN)

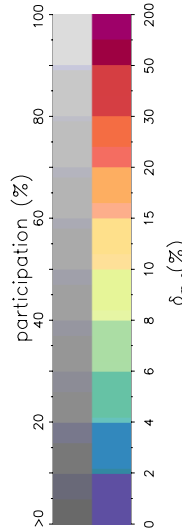


raytran & less, dart < 2 (4) %

Ofenpass Pine Stand (Winter) (HET08_OPS_WIN)



raytran & less, dart < 2 (4) %



European Commission

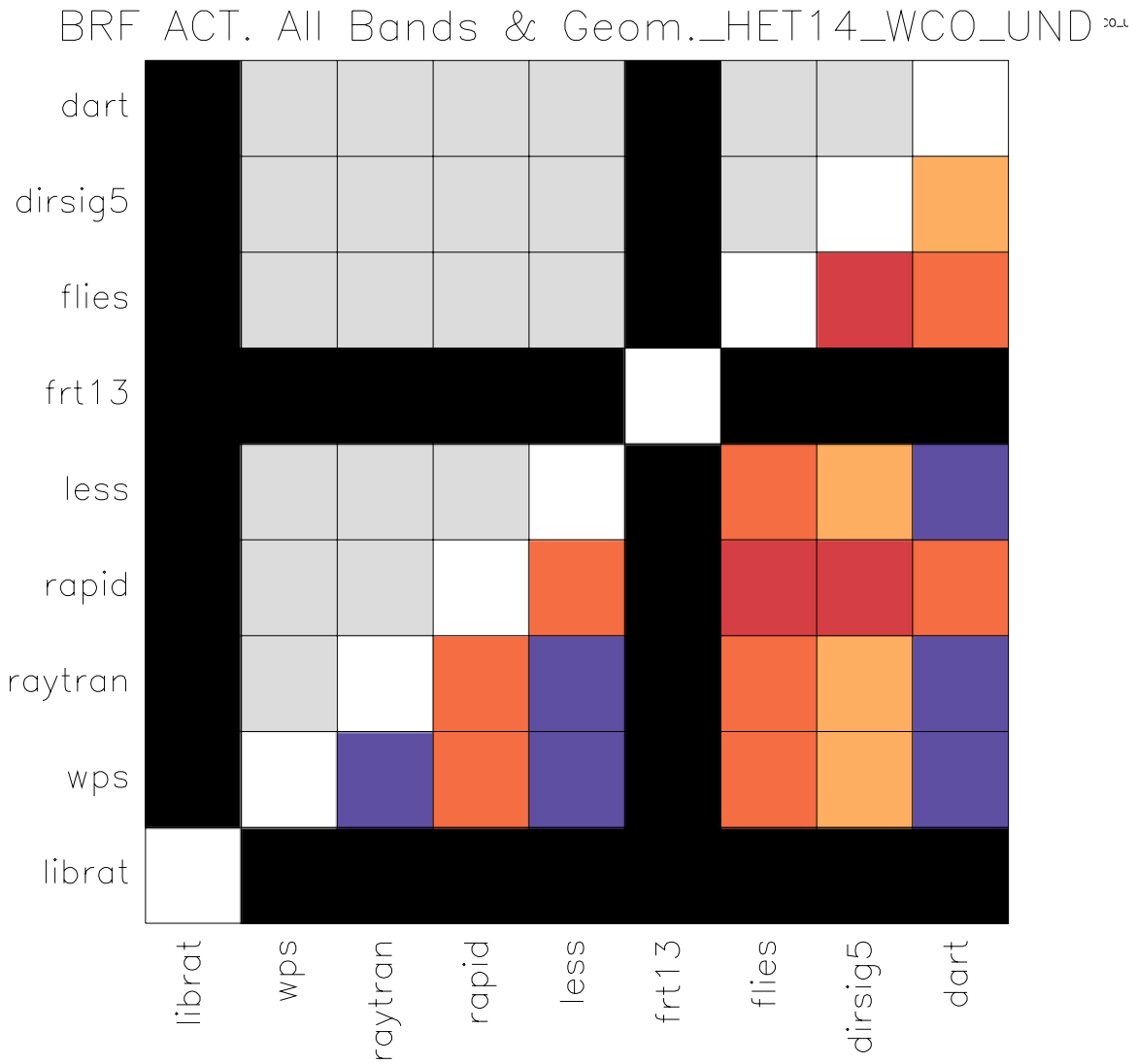
Actual Results

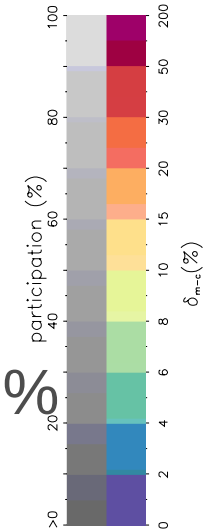
Wellington Citrus Orchard (HET14_WCO_UND)

Short Rotation Forest (HET16_SRF_UND)

Savanna pre-fire (HET50_SAV_PRE)

Wytham Wood (HET51_WWO_TLS)





raytran, wps, less, dart < 2%

European Commission

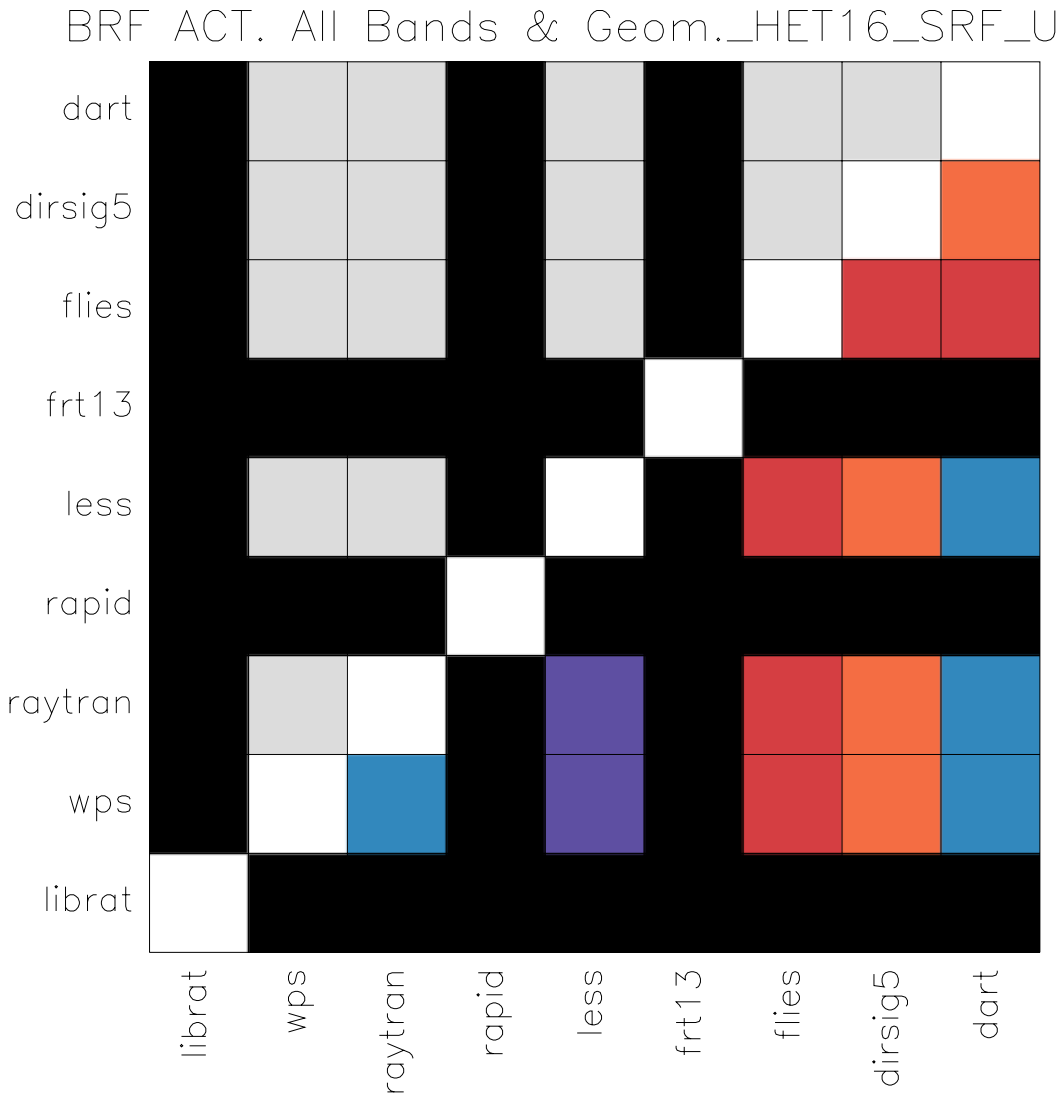
Actual Results

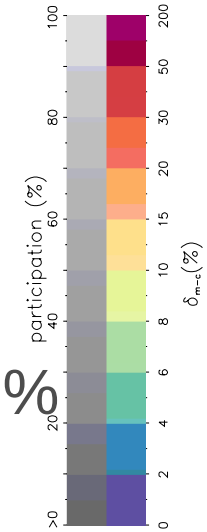
Wellington Citrus Orchard (HET14_WCO_UND)

Short Rotation Forest (HET16_SRF_UND)

Savanna pre-fire (HET50_SAV_PRE)

Wytham Wood (HET51_WWO_TLS)





raytran, wps, less, dart < 2%

raytran, wps < 2 % & dart < 4%

European Commission

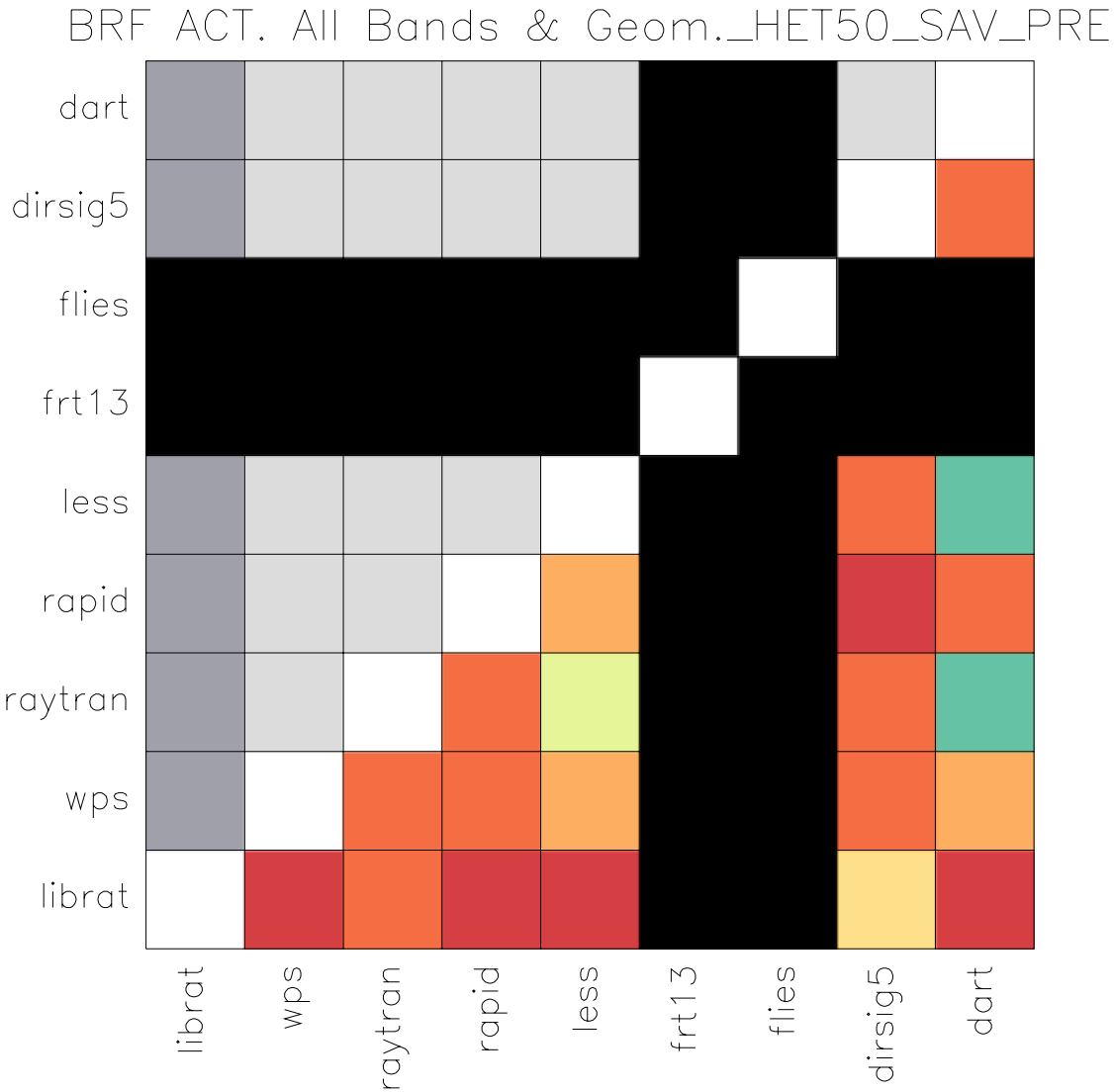
Actual Results: brfpp corner

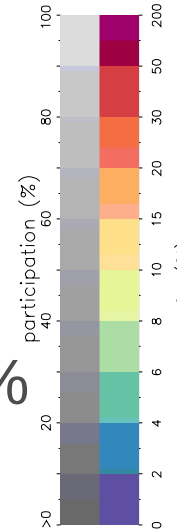
Wellington Citrus Orchard (HET14_WCO_UND)

Short Rotation Forest (HET16_SRF_UND)

Savanna pre-fire (HET50_SAV_PRE)

Wytham Wood (HET51_WWO_TLS)





raytran, wps, less, dart < 2%

raytran, wps < 2 % & dart < 4%

Oh la la …

European Commission

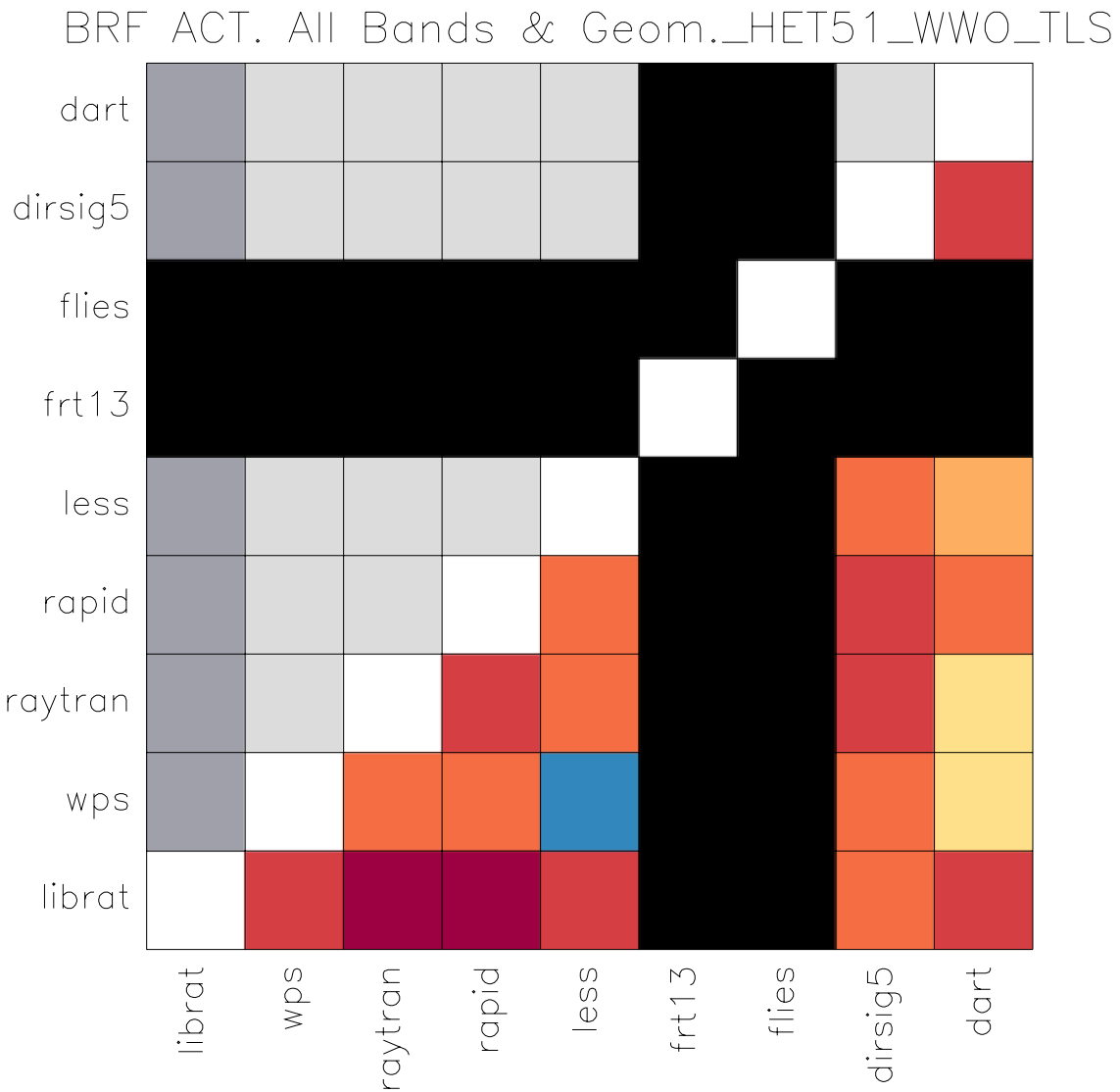
Actual Results: brfpp corner

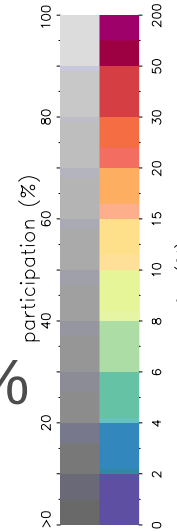
Wellington Citrus Orchard (HET14_WCO_UND)

Short Rotation Forest (HET16_SRF_UND)

Savanna pre-fire (HET50_SAV_PRE)

Wytham Wood (HET51_WWO_TLS)





raytran, wps, less, dart < 2%

raytran, wps < 2 % & dart < 4%

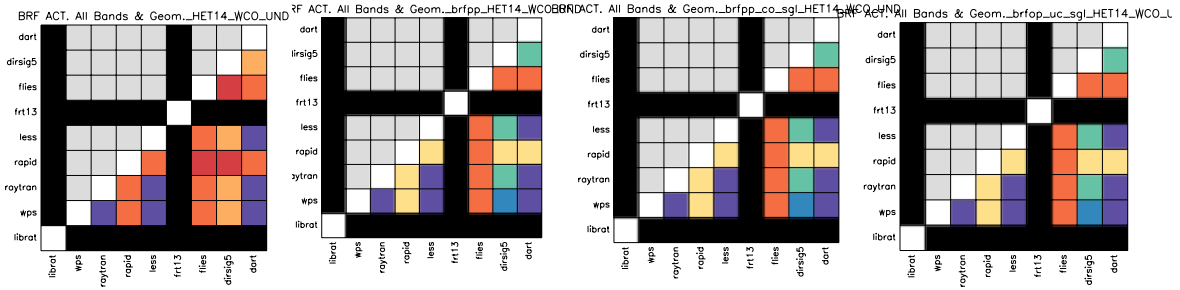
Oh la la …

wps & less < 4 %

European Commission

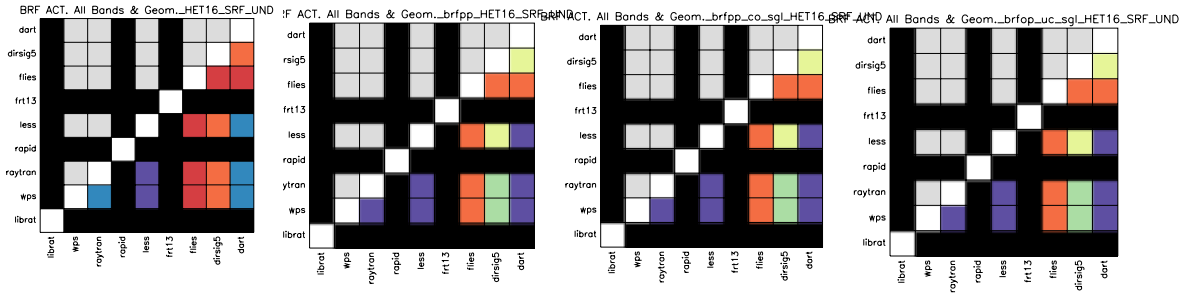
Actual Results: brfpp corner

Wellington Citrus Orchard (HET14_WCO_UND)



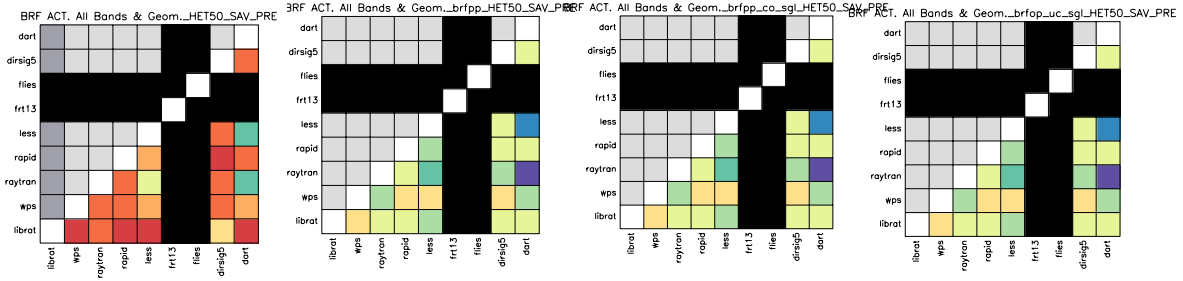
raytran, wps, less, dart < 2%

Short Rotation Forest (HET16_SRF_UND)



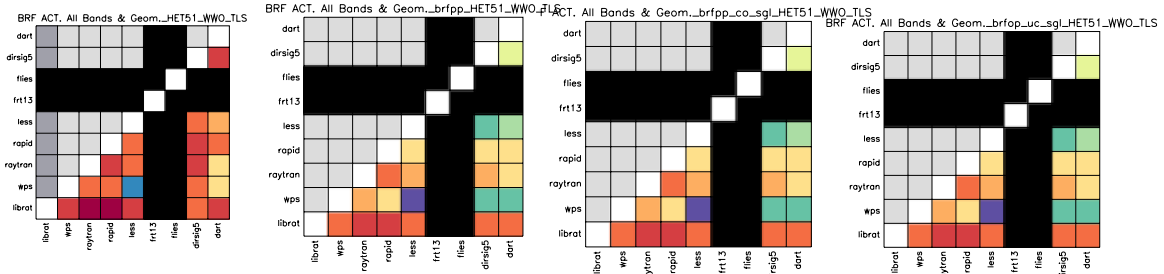
raytran, wps < 2 % & dart < 4%

Savanna pre-fire (HET50_SAV_PRE)

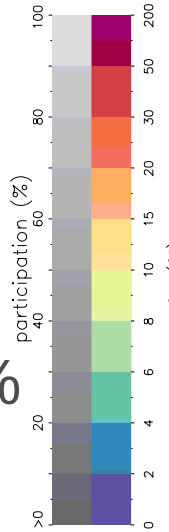


Oh la la …

Wytham Wood (HET51_WWO_TLS)



wps & less < 4 %



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Conclusions

- Abstract homogeneous canopies: so far so good – only human error was detected
- Abstract heterogeneous canopies : well done to 3D models !
- Actual canopies:
  - between (only) 2 & 3 models agree (< 2%) depending on the scene … not always the same models → It will **be very difficult to assign a reference and** to put these experiments cases in **ROMC** … as users would like.
  - New RAMI scenes … first times with a lot of issues for providing the description of the scene – do not desperate.

Next Steps

- Web site results publication → Thanks to Monica & Christian
- Peer-review publication**s**: all participants are co-authors: we will need you ;-)
  - Abstract scenes→ Nadine Gobron et al
  - Actual scenes → Christian Lanconelli et al
  - In-situ → Christian Lanconelli et al

RAMI-V models

Model	Participants	*Reference*
dart	Yingjie Wang	*Gastellu-Etchegorry et al. (1996)*
dirsig5	Adam Goodenough	*Goodenough & Brown (2017)*
discret	Nadine Gobron	*Gobron et al. (1997)*
eradiate	Sebastian Schunke	*Eradiate.eu (Copernicus Community Model - 2021)*
flies	Hideki Kobayashi	*Kobayashi & Iwabuchi (2008)*
frt13 (*)	Andres Kuusk	*Kuusk & Nilson (2000), Kuusk et al. (2010, 2014)*
less	Jianbo Qi	*Qi et al. (2019)*
librat	Nial Oregon	*Disney et al. (2009)*
rapid	Huaguo Huang	*Huang et al. (2018a, 2018b)*
raytran	Christian Lanconelli	*Govaerts & Verstraete (1998)*
randerjay	Martin van Leeuwen	*van Leeuwen et al. (2021)*
spartacus	Robin Hogan	*Hogan et al. (2018)*
starter1	Zeng Yelu	*Zeng et al. (2018) and Wu et al. (2021)*
wps	Feng Zhao	*Zhao et al. (2015, 2016)*

*** frt13** *is an updated version of the model* **frt** (RAMI-IV)

New models
Models which contributed to RAMI-IV phase

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Thank you

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