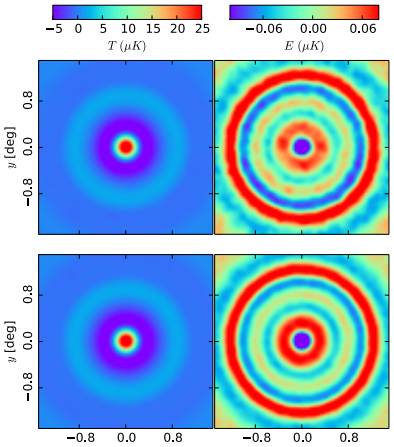
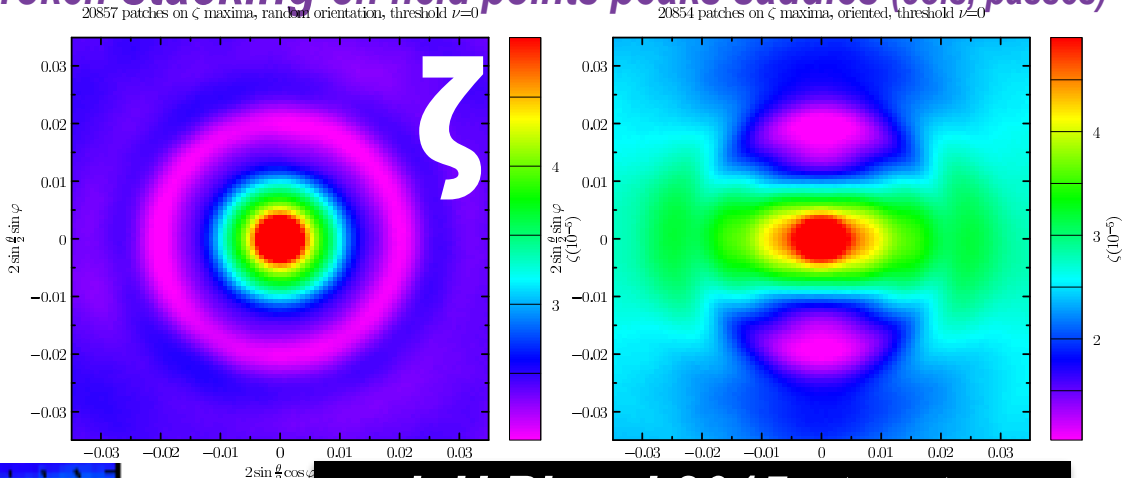
Zhiqi Huang CITA => prof @SunYatSen U one of the thousand talents
+ Dick Bond Planck & Spider (XFaster for TEB power) & ACTPol

Topography of the CMB Web, ISM Web, y-web, IQU/ E B
oriented/symmetry-broken stacking on field points peaks saddles (cols, passes)

Louis+16
ACTPol *stack*
<T,E,B|T-field>

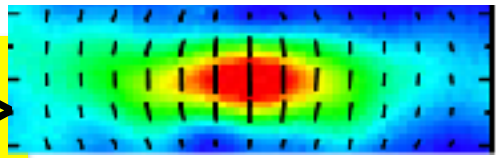
B+Frolov+Huang 17





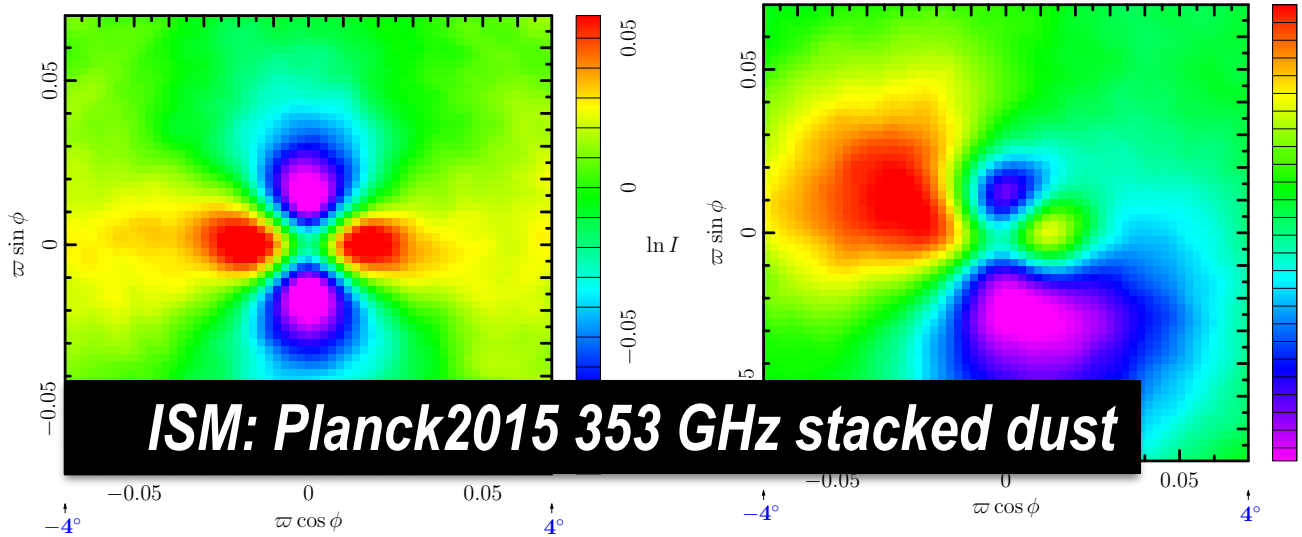
earlyU Planck2015 structure stacked ζ-map | ζ-pk TQU>

<Qr |oriented I-pk>



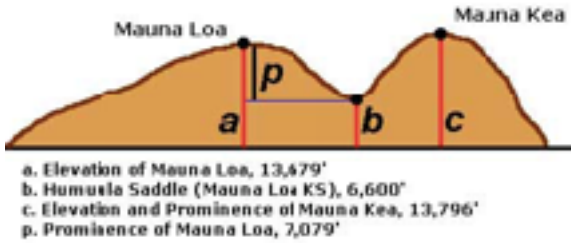
stacked on 7779 cols, Hessian oriented

stacked on 7779 cols, Hessian oriented



ISM: Planck2015 353 GHz stacked dust

stacked + Hessian
+ direction info
<ln **I | I-saddle**
broken symm>



Stacking @ CITA - oriented asymmetric *on extrema & other points*

CITA mini-industry Alvarez, Bond, Stein, Codis + Huang + Connor Bevington, Bruno Régaldo-Saint Blancard & to LIM w/ Ronan Kerr

Topography of the CMB-web, ζ-web, IQU/ E B, ISM-web, y-web, LIM/LAM web

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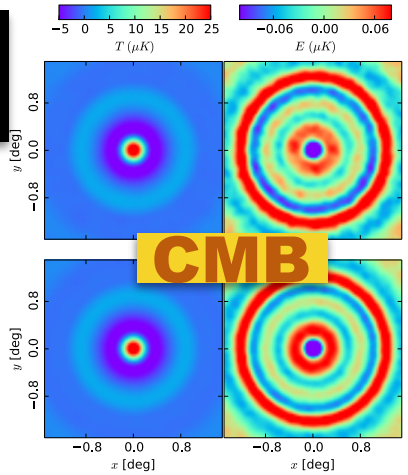
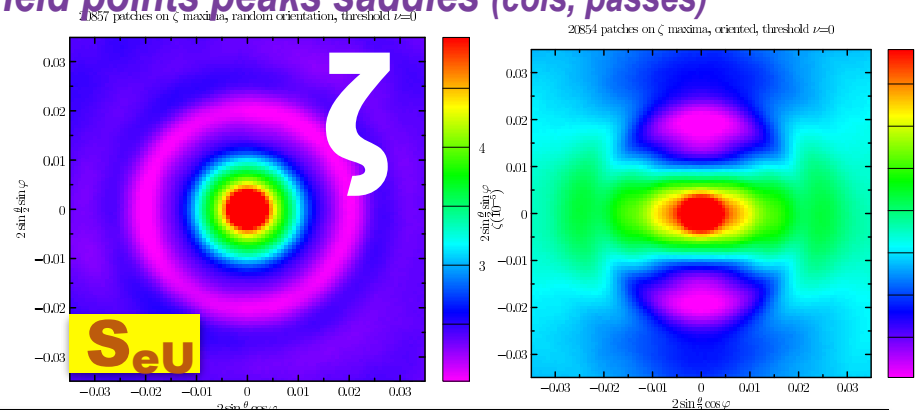
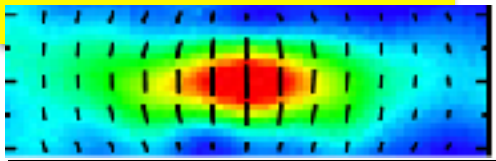
ACTPol *stack*
<T,E,B|T-field>

B+Frolov+Huang 18





<Qr |*oriented l-pk*>



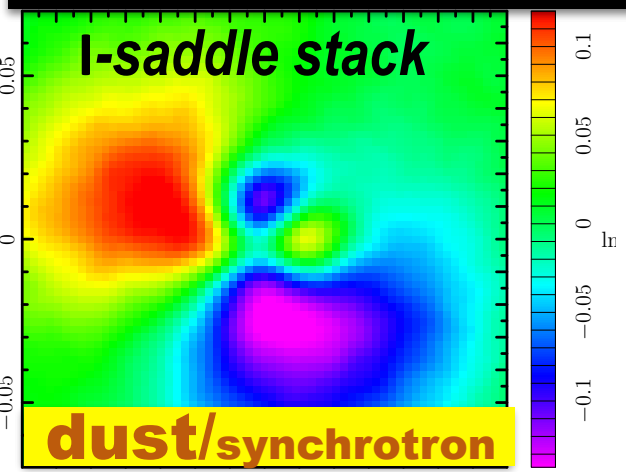
earlyU SuperWeb map Planck2015 XVII
stacked ζ-map | ζ-pk TQU> BFH17

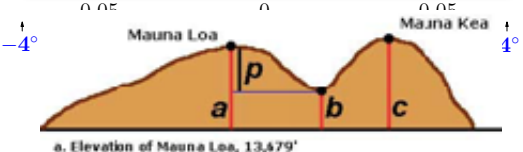
Planck 353 GHz stacked dust

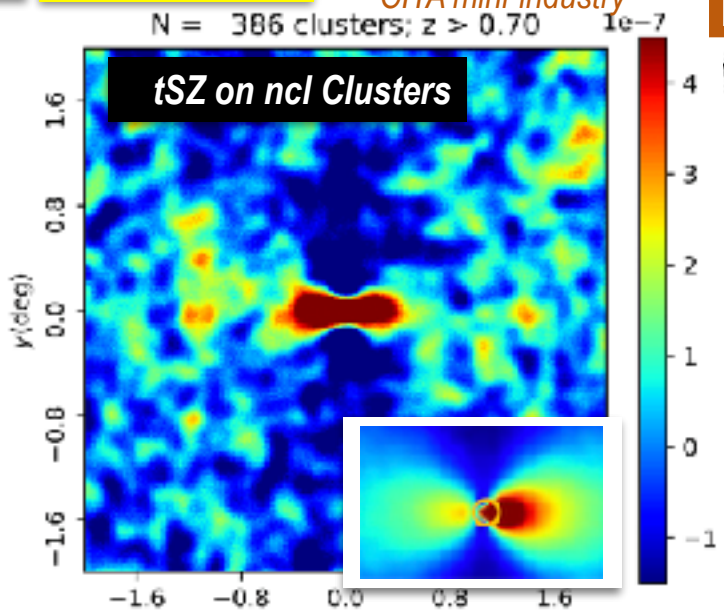
tSZ ncl

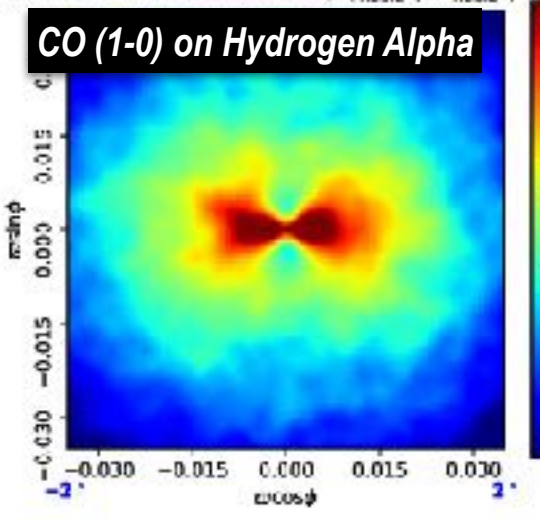
CITA mini-industry

LIM/LAM *CITA mini-industry*









Stacking @ *CITA - oriented asymmetric* on extrema & other points

CITA mini-industry Alvarez, Bond, Stein, Codis + Huang + Connor Bevington, Bruno Régaldo-Saint Blancard & to LIM w/ Ronan Kerr

Topography of the CMB-web, ζ-web, IQU/ E B, ISM-web, y-web, LIM/LAM web

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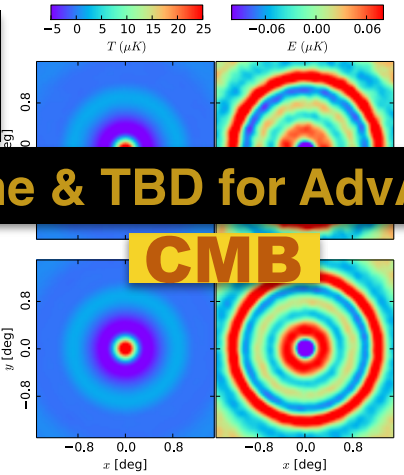
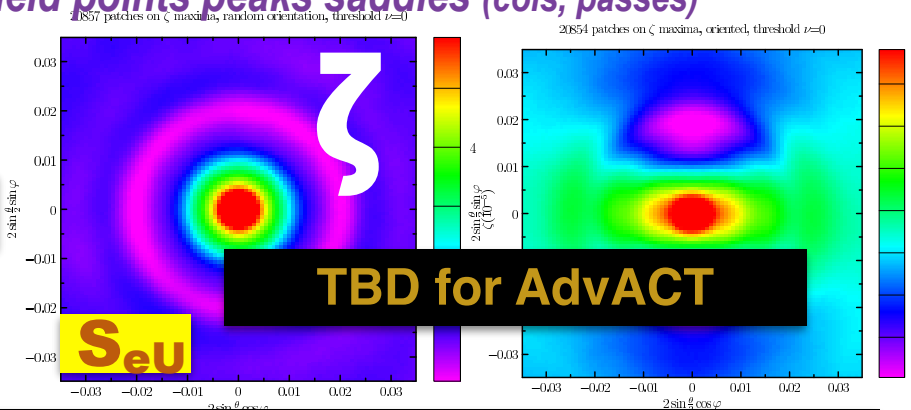
ACTPol *stack* **<T,E,B|T-field>**

B+Frolov+Huang 18

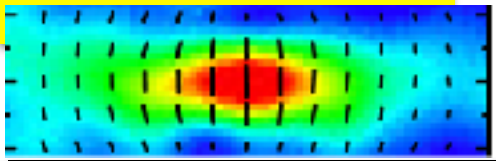
Done & TBD for AdvACT





TBD for AdvACT

<Qr |oriented l-pk>



earlyU SuperWeb map *Planck2015 XVII*

stacked ζ-map | ζ-pk TQU> BFH17

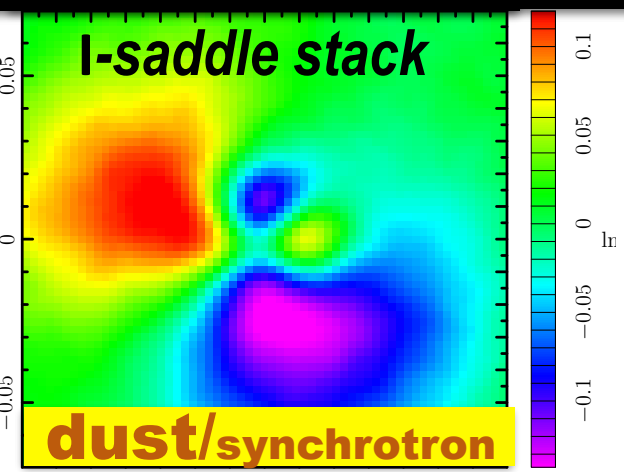
TBD for AdvACT+P *dust*

tSZ ncl

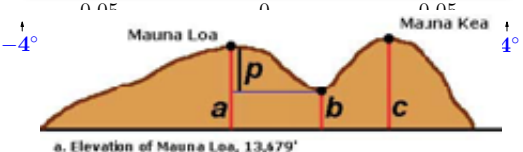
CITA mini-industry

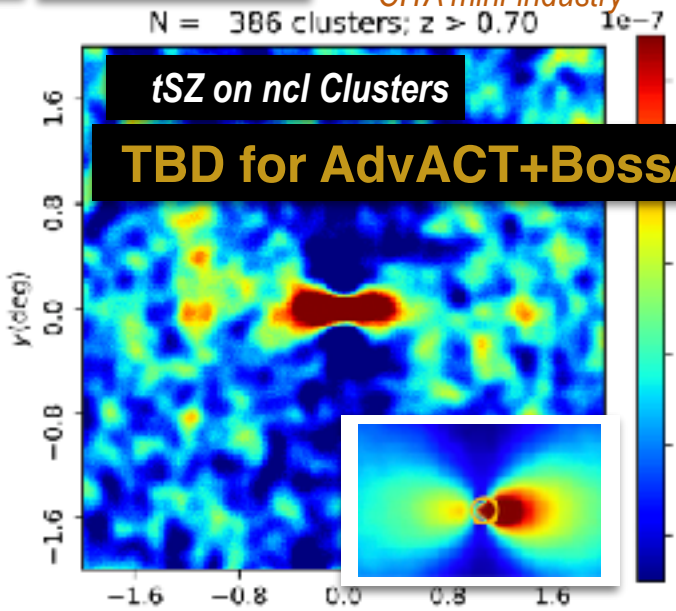
LIM/LAM *CITA mini-industry*

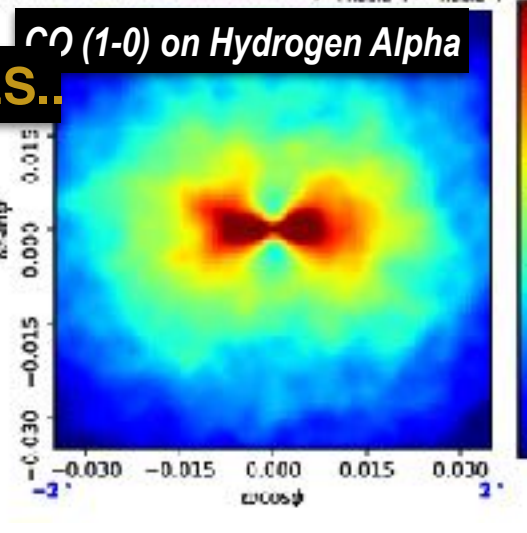
l-saddle stack



dust/synchrotron





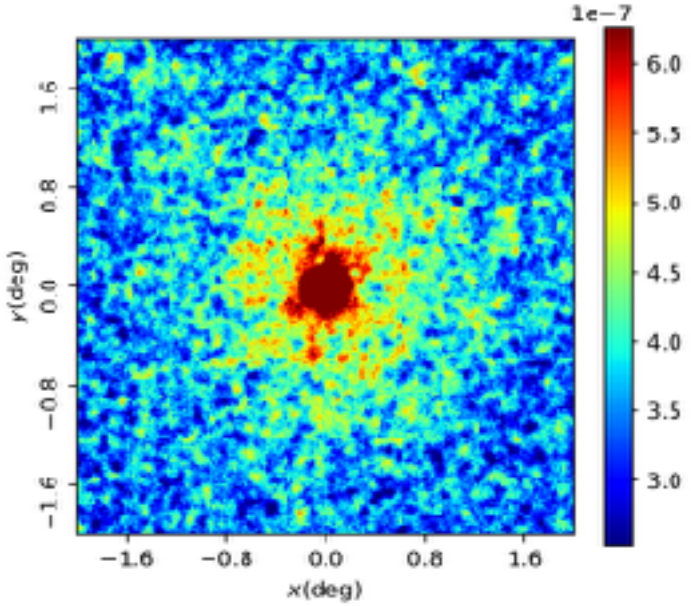


CITA mini-industry Alvarez, Bond, Stein, Codis + Huang + Connor Bevington, Bruno Régaldo-Saint Blancard & to LIM w/ Ronan Kerr

Unoriented tSZ stacking (Planck y-map)

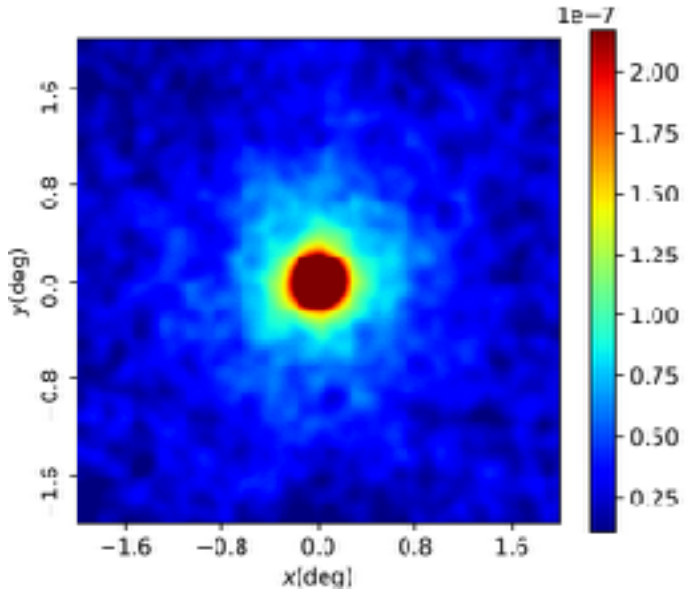
$< tSZ|tSZ >$

~43000 hot peaks; peak finding on 10’ (map presmoothed to 10’)



$< tSZ|n >$

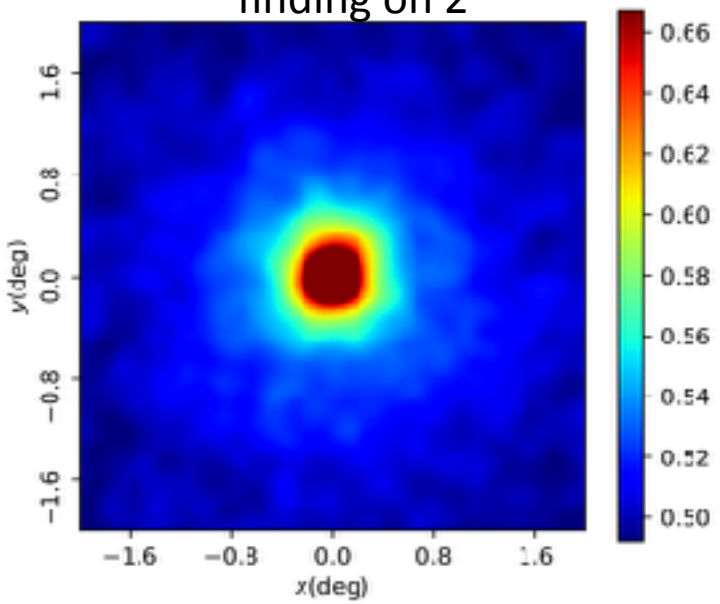
~75000 WHL clusters aka SDSS Wen+12



Unoriented tSZ stacking (simulations with perfect resolution aka ~AdvACT)

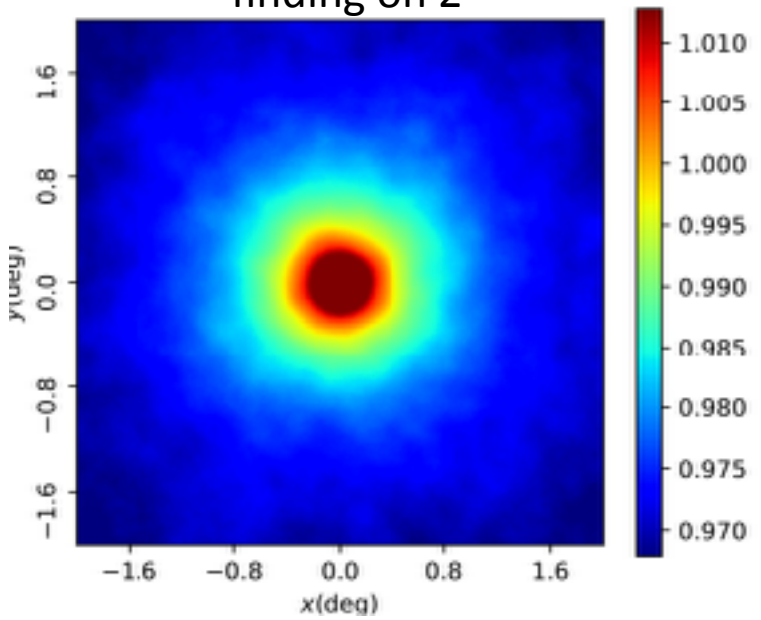
< tSZ|tSZ >

~24000 hot peaks; peak finding on 2’

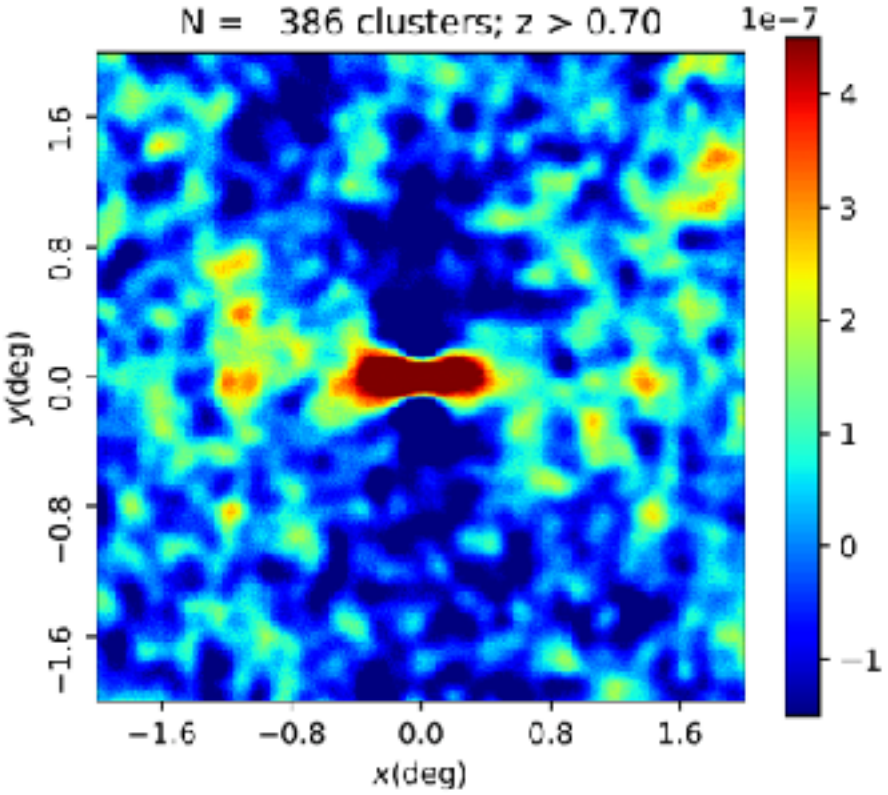


< tSZ|n >

~87000 hot peaks; peak finding on 2’



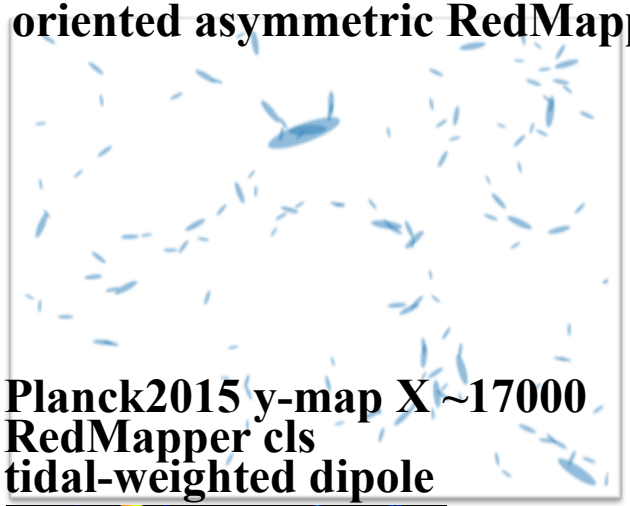
Build up of Planck <tSZ|n> stack



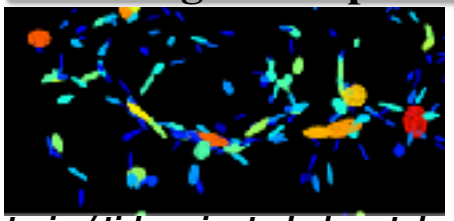
~75000 WHL clusters aka SDSS Wen+12

Sphericalized ensembles: the anisotropic web is averaged-out
Interconnected web - bent group-ful bridges + tSZ gas outside?

oriented asymmetric RedMapper cls



Planck2015 y-map X ~17000
RedMapper cls
tidal-weighted dipole



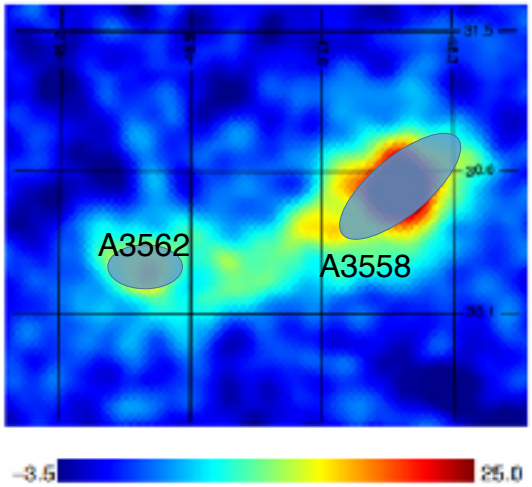
strain / tide oriented pk-patches aka halos
in final-state space (Eulerian space)

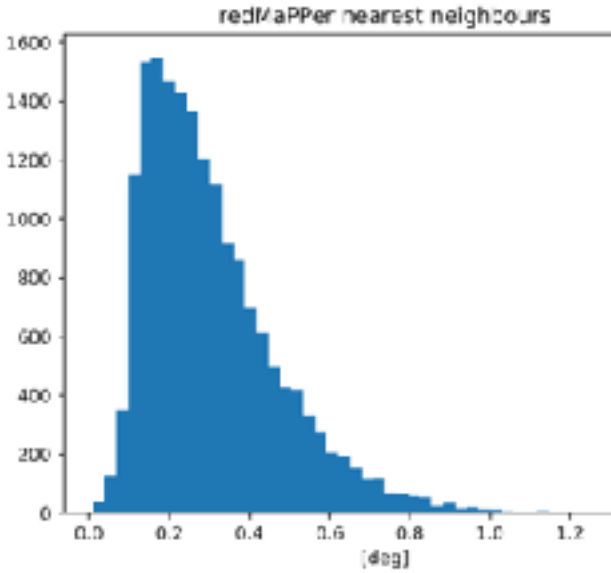
filament zoom

intrinsic alignment

important noise source for
weak lensing of galaxies

Shapley Supercluster 20cls
200Mpc z=.046 > $10^{16}M_{sun}$
Planck 2015 Results XXII



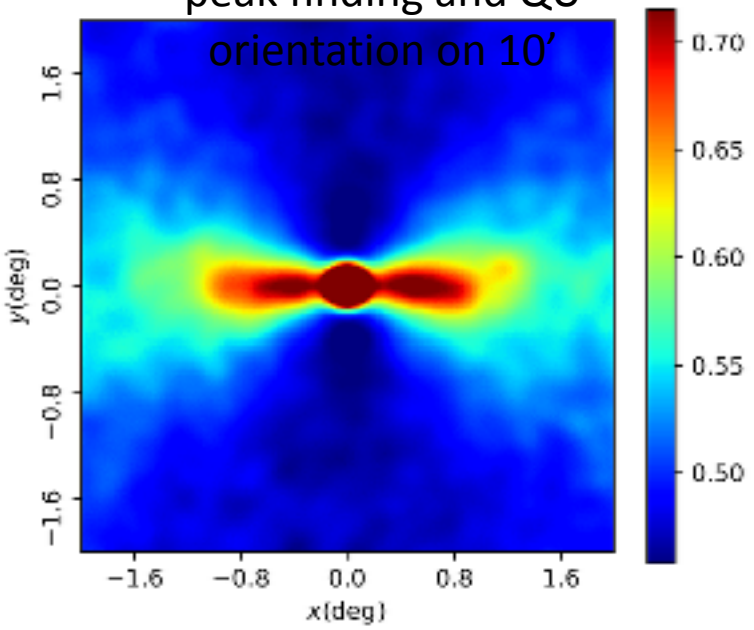


tSZ stack on nearby pairs not great control over different population contributions

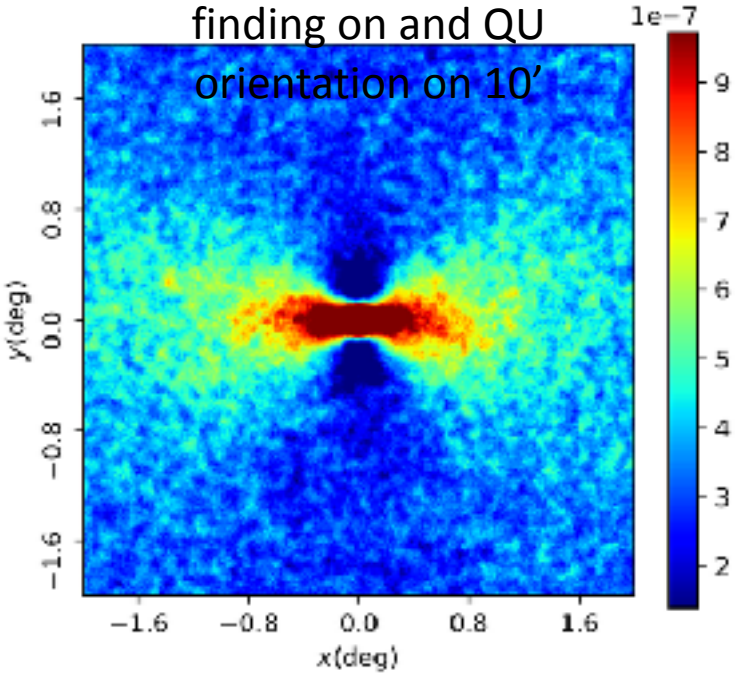
tried Saraswati supercluster z~.28, > Shapley?, saw 2 cls in y map, no others in tSZ though we know position AdvACT resolution & sensitivity will help for individual SCs

<tSZ|tSZ> QU oriented results: Peak-patch & Planck

~7600 simulation peaks; peak finding and QU orientation on 10’

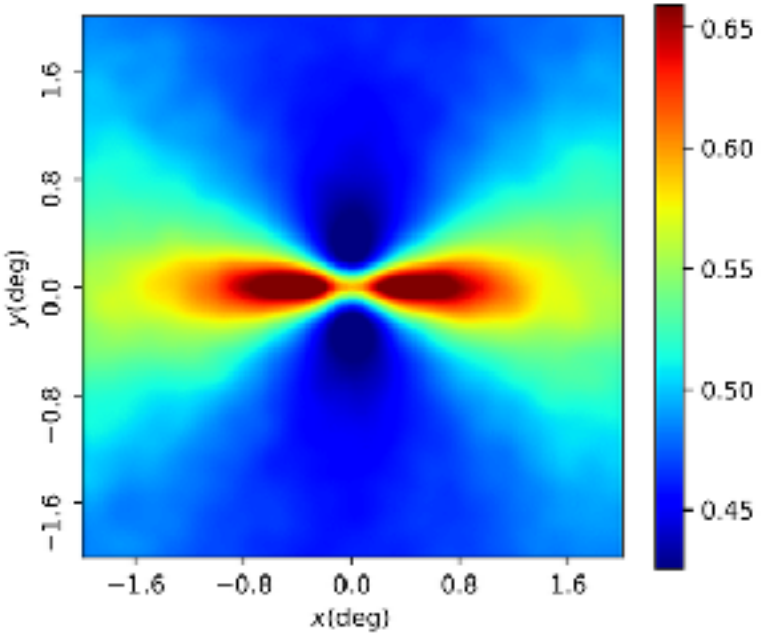


~43000 Planck peaks; peak finding on and QU orientation on 10’

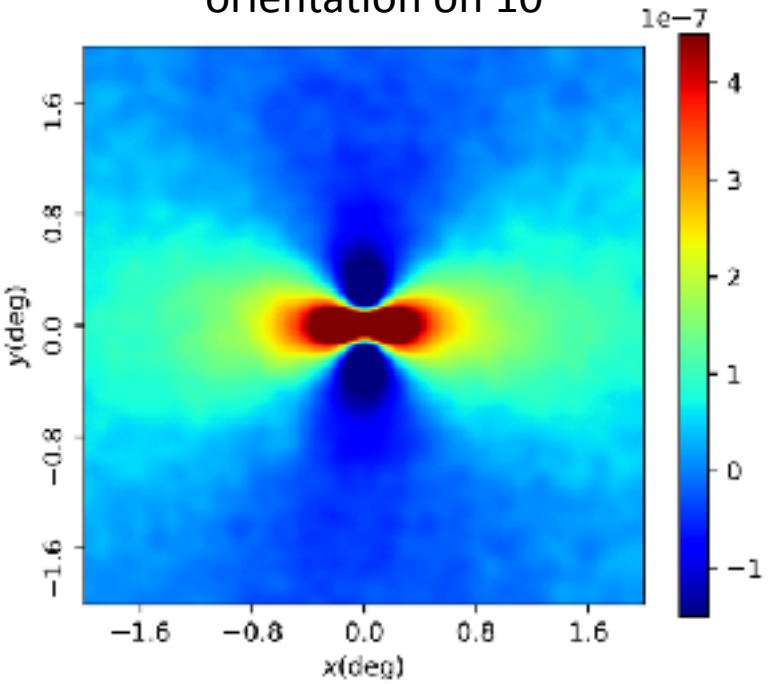


<tSZ|n> QU oriented results: Peak-patch & Planck

~68000 nearby haloes; QU orientation on 10’



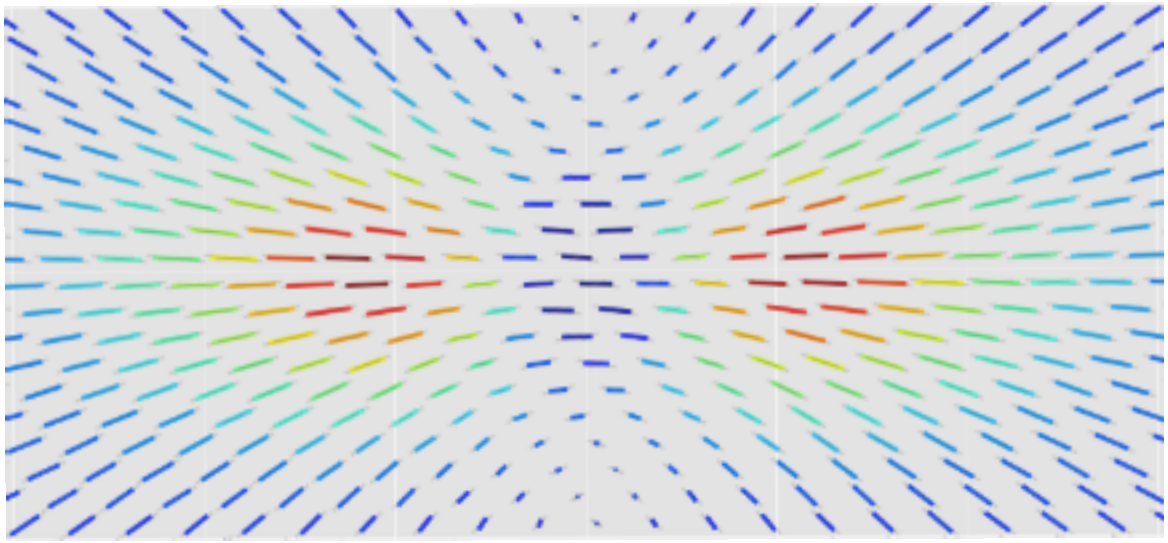
~75000 WHL clusters; QU orientation on 10’

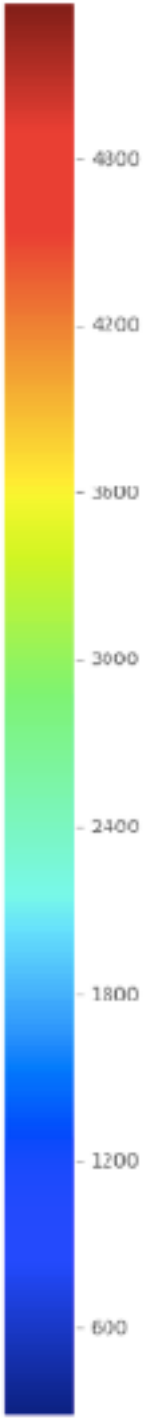


Projected-strain/tide 2D stacks

10Mpc X 30Mpc all masses

$\langle n_{halo} | \mathcal{C}\text{-oriented} \rangle (x)$

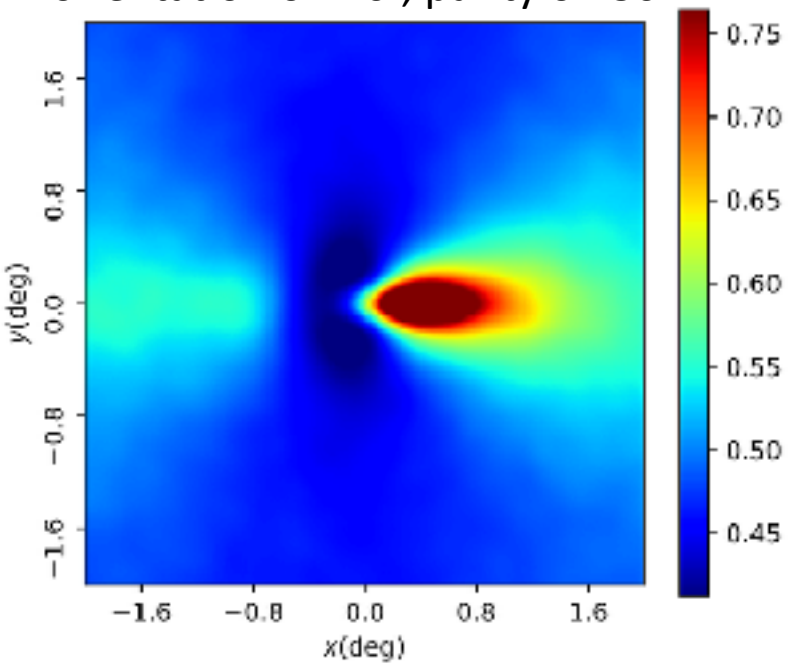




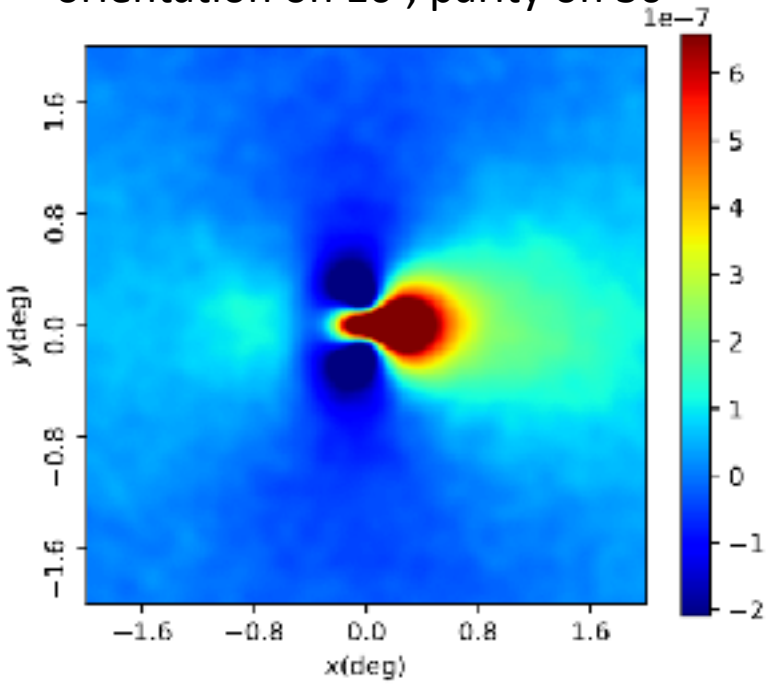
headless vectors show strain tensor orientation

Beyond oriented: Symmetry breaking on <tSZ|n>

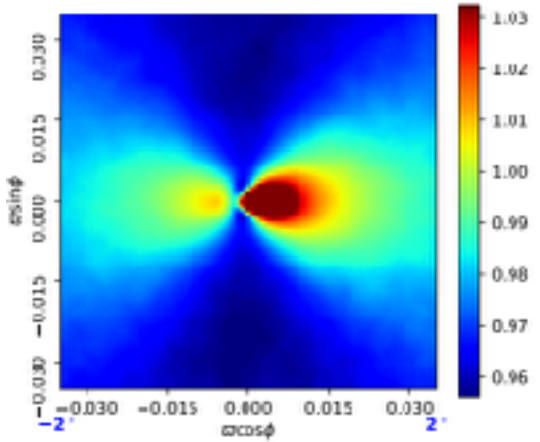
~68000 nearby haloes; QU orientation on 10’; parity on 30’



~75000 WHL clusters; QU orientation on 10’; parity on 30’



dipolar symmetry breaking => positive axes choice cf. beyond the headless 2-basis of pure orientation



parity on 10’

m-Susceptibilities => new approaches to stacking

generalized random field 'cluster-expansion' aka halo expansion for a ***q-charge density*** *in Eulerian space: e.g., M_{tot}, PV, Vol_E*

$$u_q(x)=\sum_c \chi_{qc}(x-x_c,R_{Ec})q_c\delta N_c(x_c,R_{Ec})+u_{qf}(x)\Theta_{VE}+u_{qf}(x)(1-\Theta_{VE})$$

& ***q-charge current***: $J_q(x)$

inside = $\Theta_{VE}(x)$ *BM's* $\mathcal{E}_{hpk}$, *1 or 0 outside =* $1-\Theta_{VE}(x)$=complement

response functions to stimuli= mean susceptibilities

χ_{qc} ***susceptibility*** *of* u_q *to the "charge"* q_c *the art of halo models*

$$\text{susceptibility}(q\,\mathcal{C}1)(y)=\langle[\rho_q(X_c+s_c(y)]/q_c\, n_{\mathcal{C}}(X_c)\rangle \langle n_{\mathcal{C}}(X_c)n_{\mathcal{C}1}(X_{c1})\rangle^{-1}$$

curious example: response fn of halos - delta function

stack OK if you don't go to the far field, but these χ_{qc} *as impt to measure as* C_{qc}

χ_{qc} *via FT of qn stack and divide by FT of nn stack … but need to clean/apodize etc.*

FT cleaning: m-expansion in 2D, YLM in 3D, hence scalar, dipole, quadrupole, octupole & beyond. reconstruct oriented asymmetric stacks by combining multipole stacks.

=> control of supercluster-ensemble measures. tSZ but also dust, CMB, CIB, lens, ζ, kSZ 3,4-filament mapping of far field cf. near field. multifield teasing of local web structures

nonG