

Effelsberg-Bonn HI Survey (EBHIS)

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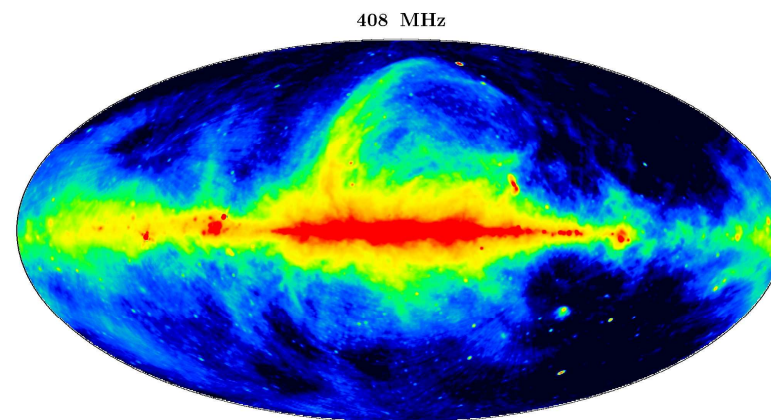
²Max-Planck-Institut für Radioastronomie



7800 m² collecting area
High sensitivity 1.4 K/Jy
Fully steerable



EBHIS is the first full sky-survey
with Effelsberg 100-m dish after the
408 MHz (Haslam et al. 1982)

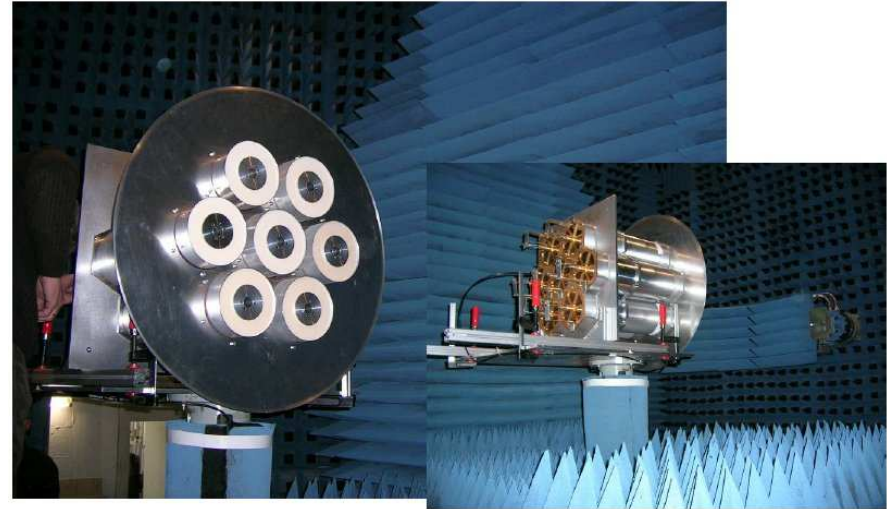
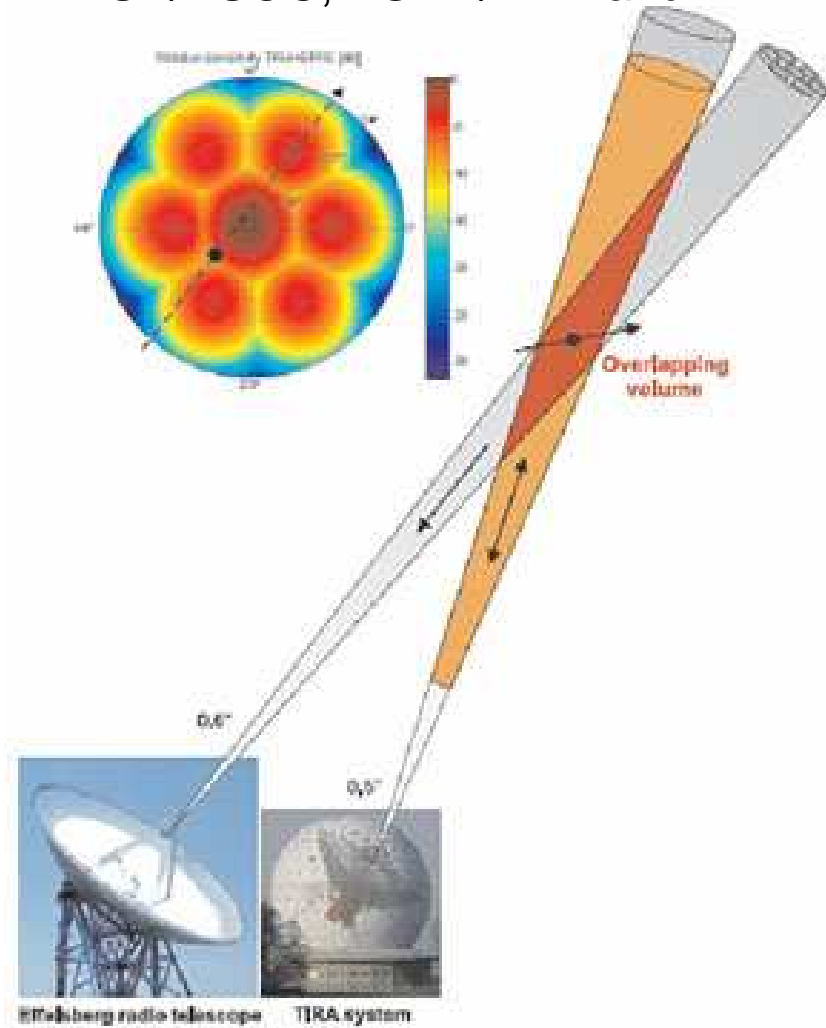


Jodrell-Bank 250-feet + Effelsberg 100-m + Parkes 64-m



EBHIS: receiver system

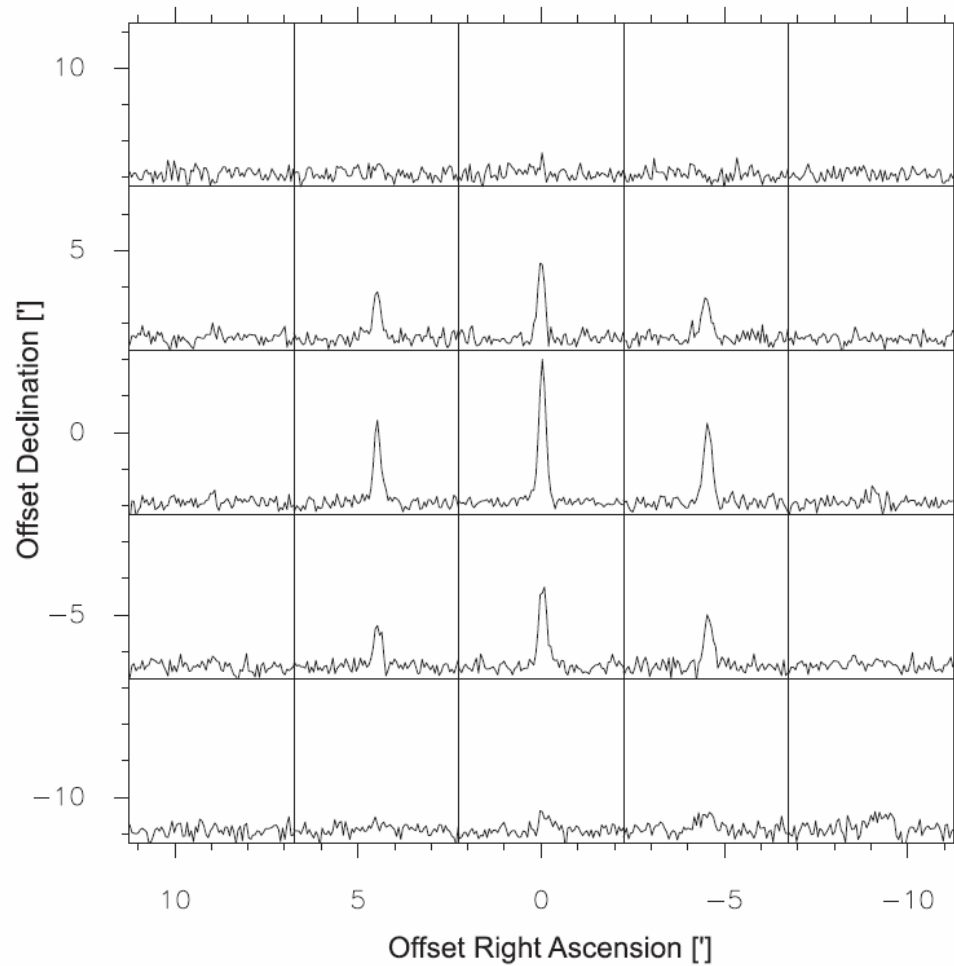
ESA/ESOC, FGAN/FHR and MPIfR



EBHIS concept

- Galactic and extragalactic HI survey in parallel:
 - 21.400 square degrees
 - 100 MHz bandwidth $z \leq 0.07$ (270 Mpc)
 - 14 spectrometer with 16384 spectral channels each
 - Milky Way
 - High angular resolution → fully sampled grid 1/16(44) LAB
 - High spectral resolution → close to 2 kms^{-1} CNM ($T_{\text{kin}} \approx 100 \text{ K}$)
 - High speed dumping → 0.5 second RFI mitigation
 - Multiple coverages → stray-radiation correction
 - Extragalactic part
 - Complementary to other multi-feed survey projects (HIPASS)
 - Mass sensitivity $3 \cdot 10^7 M_{\text{Sun}}$ at Virgo distance ($M = 6.2 \cdot 10^5 \cdot D^2 [\text{Mpc}]$)
 - High spectral resolution (RFI strategy)
 - Large survey area → large number of low mass galaxies (mass function depending on environmental conditions)

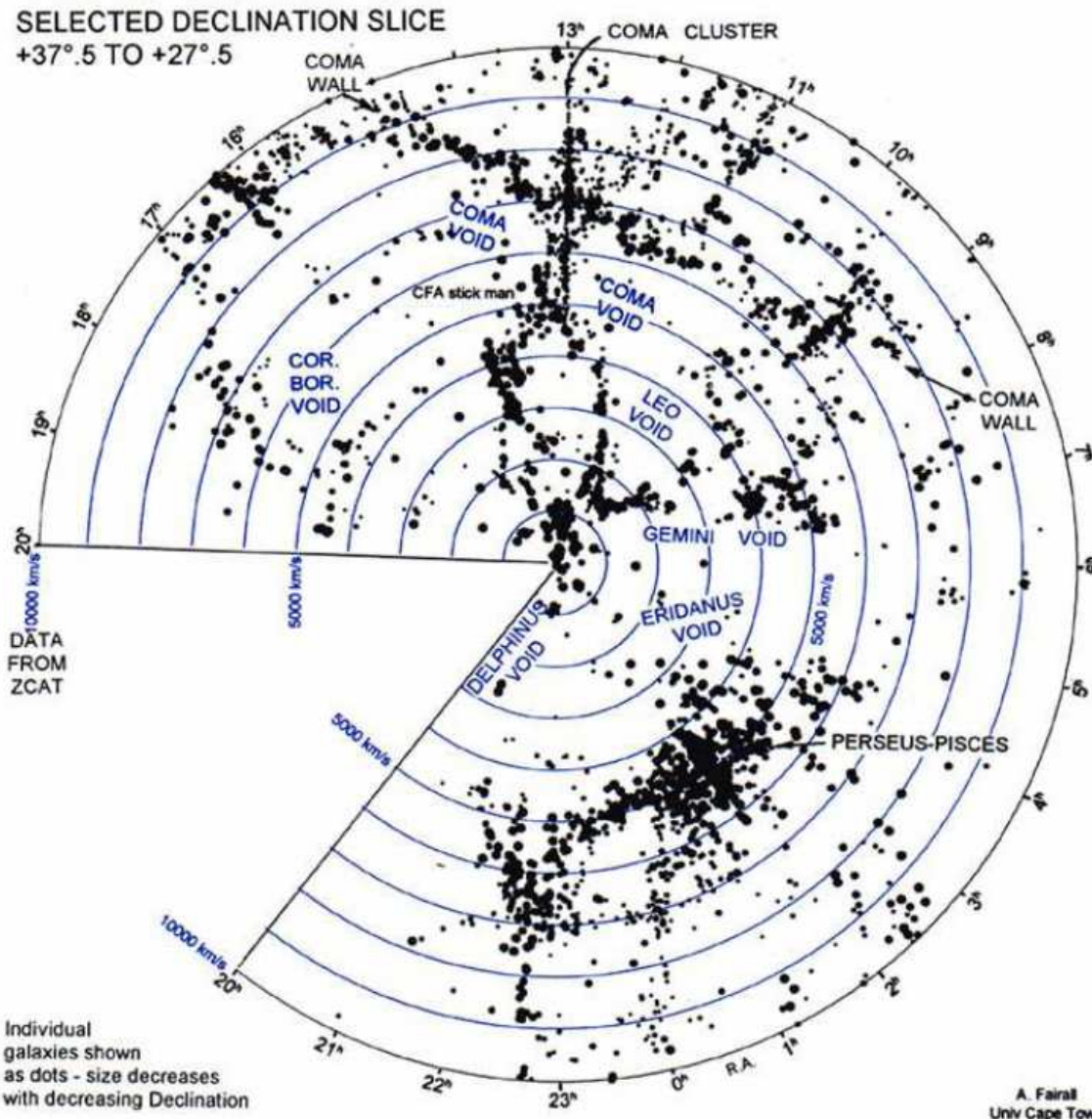
EBHIS concept



HVC 289+33+251

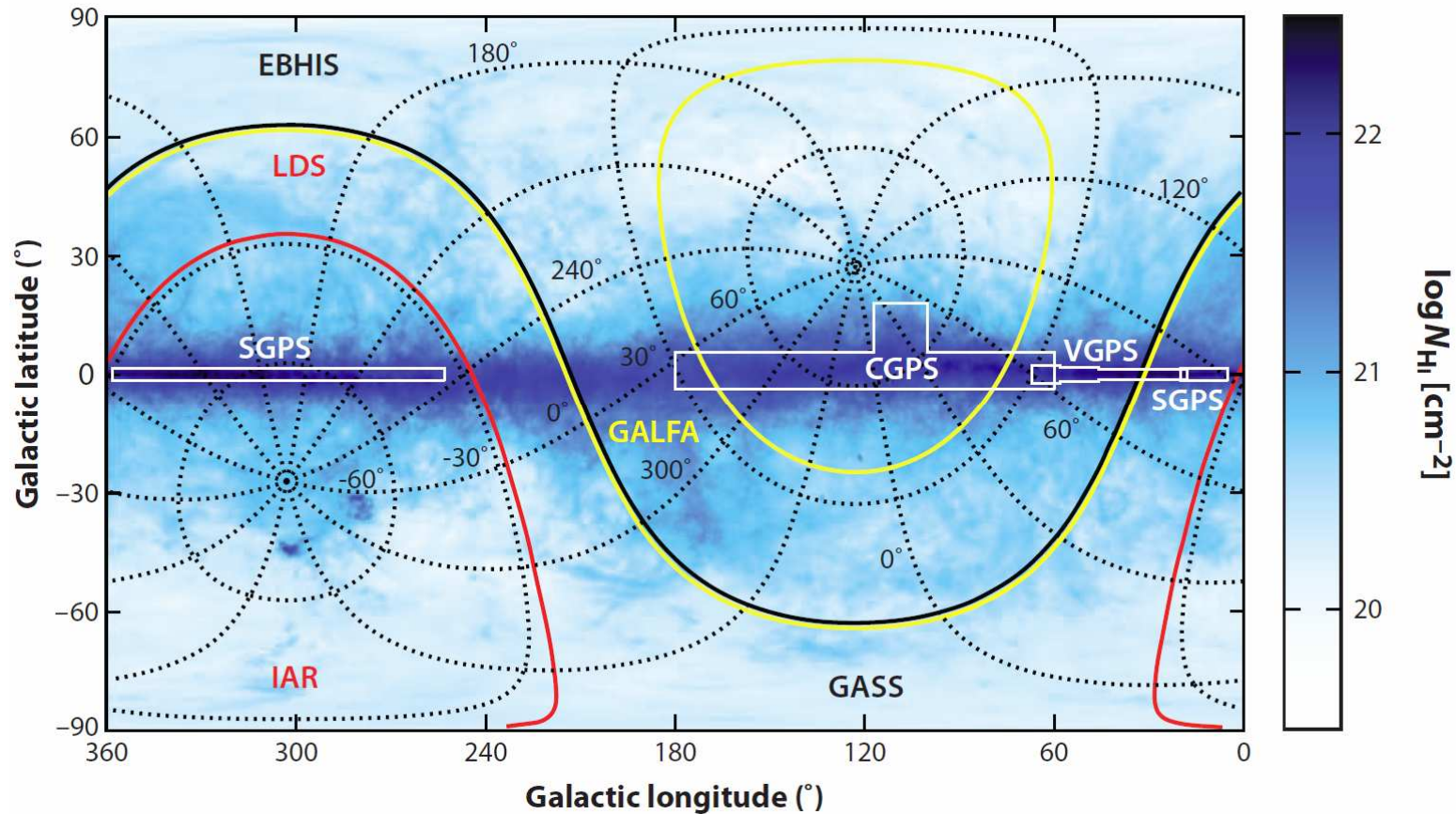
Brüns & Westmeier 2004, A&A 426, L9

EBHIS concept



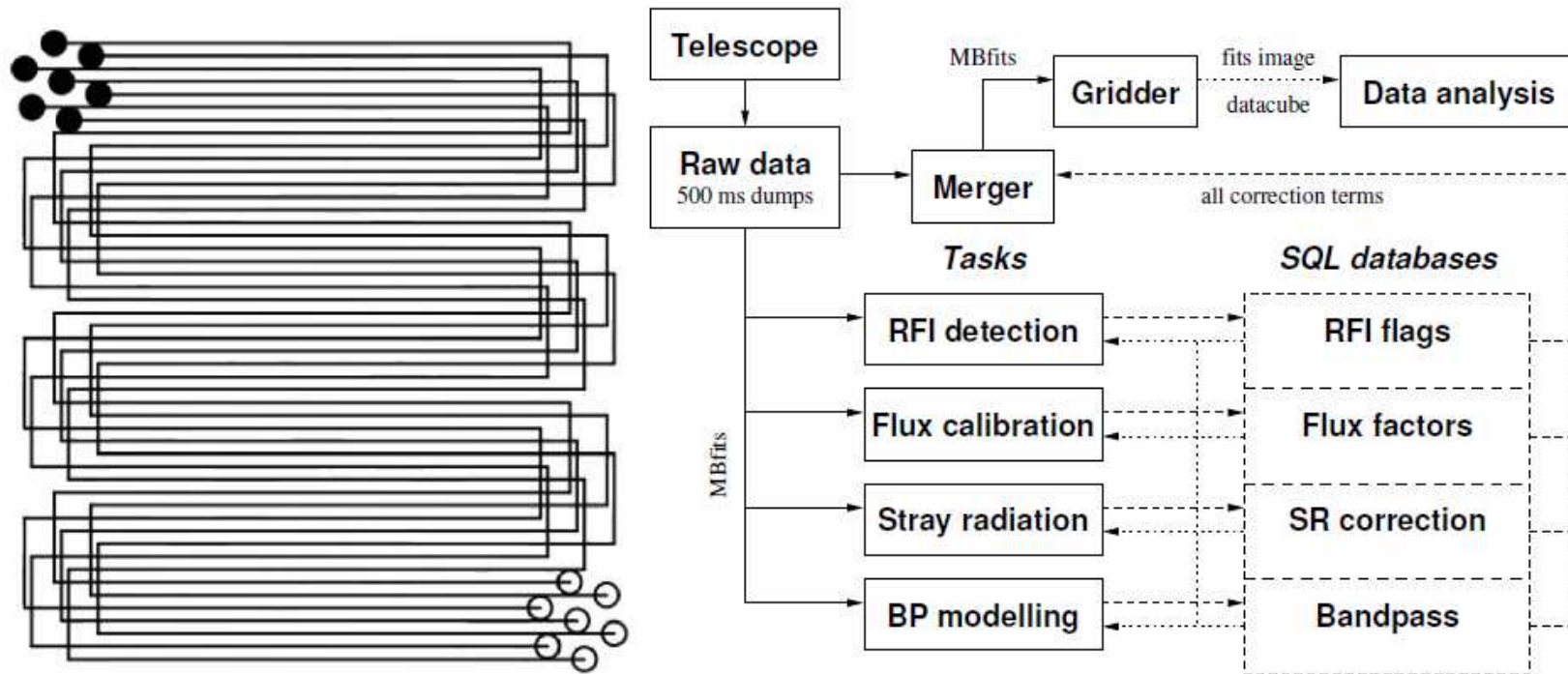
EBHIS concept

Galactic survey areas



EBHIS: Observing mode and data reduction

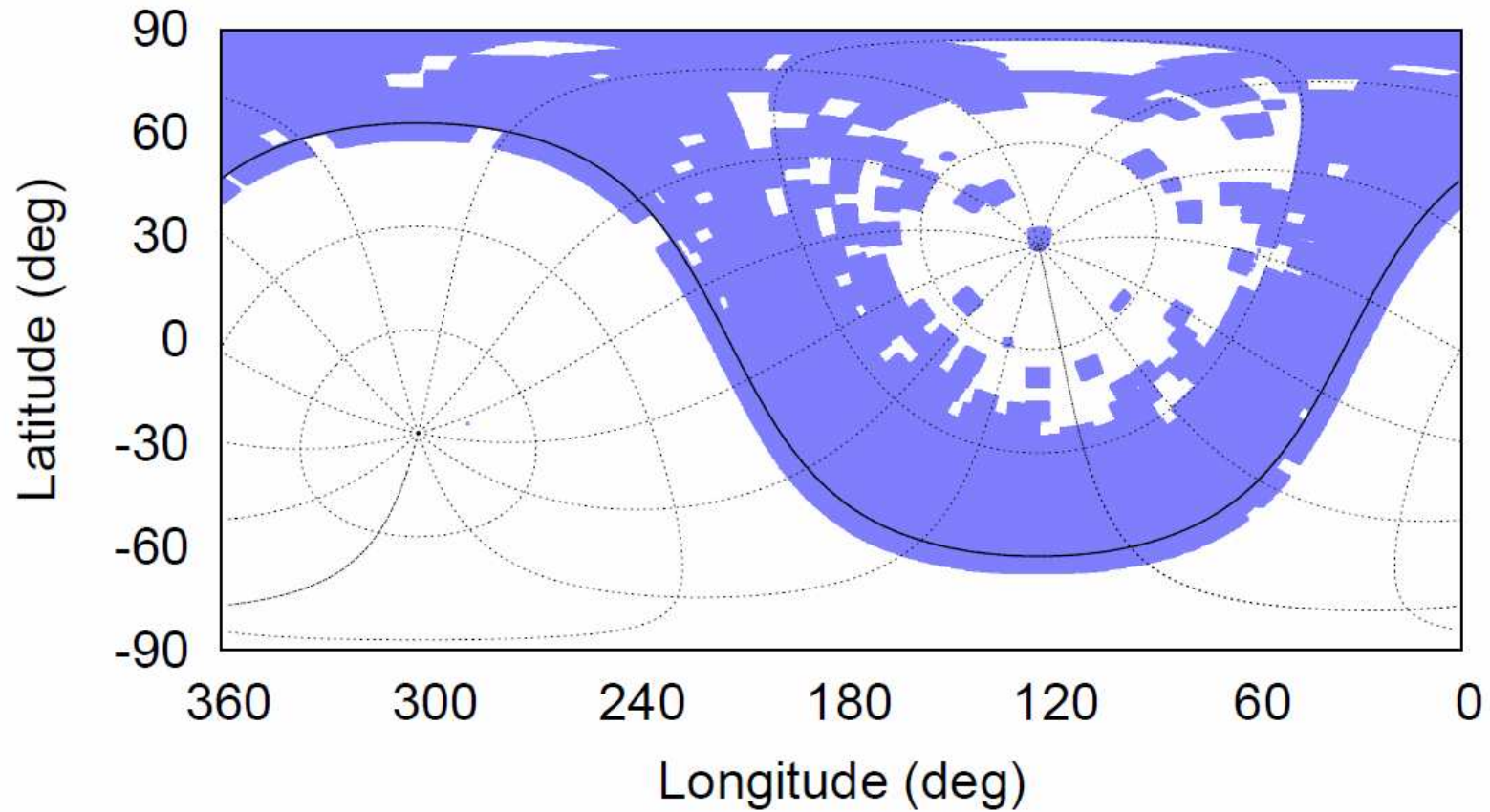
5°x5° fields, $\Delta T < 90\text{mK}$



Peek & Heiles 2008

Winkel et al. 2010

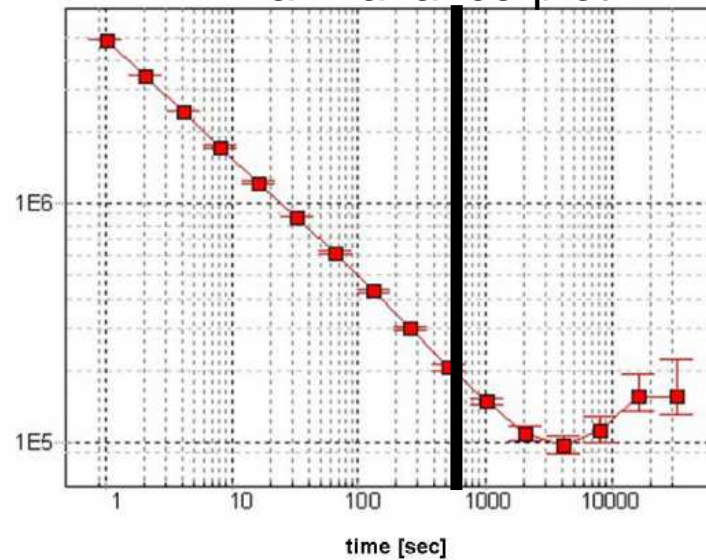
EBHIS: current coverage



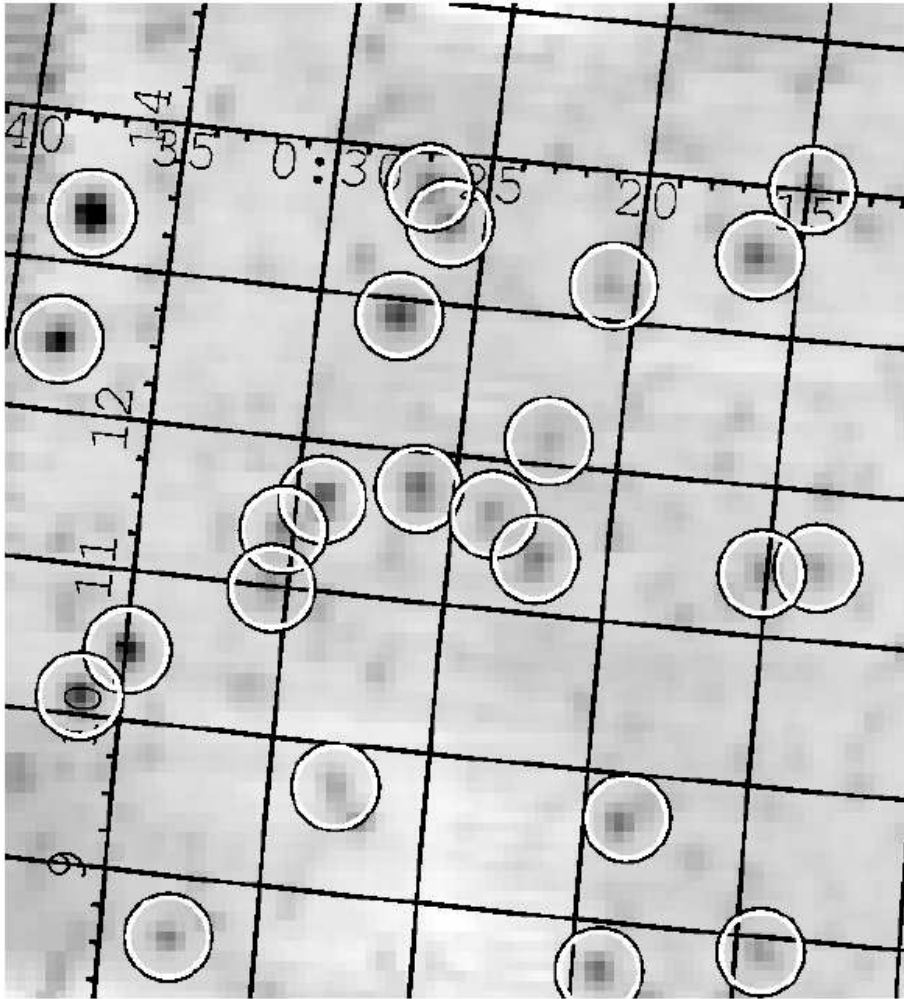
EBHIS setup: FPGA spectrometer



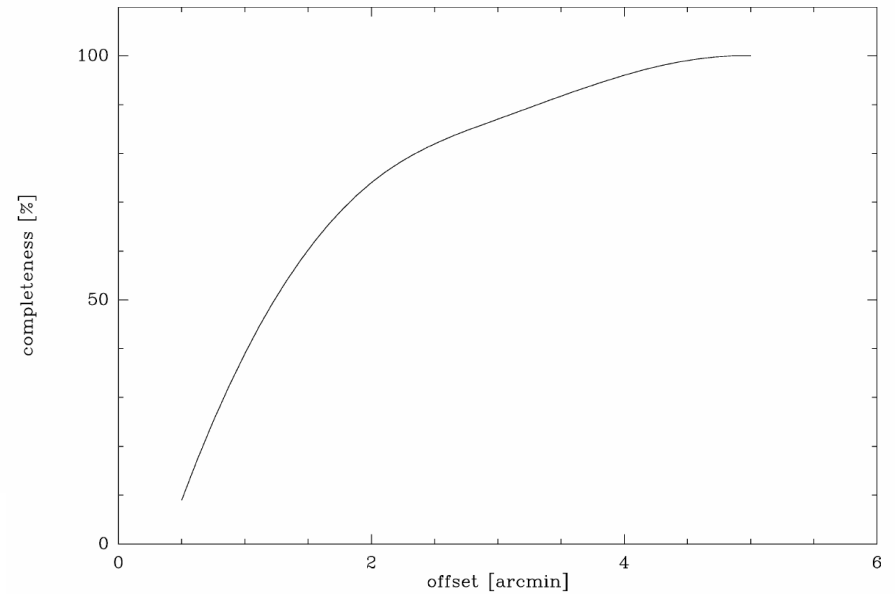
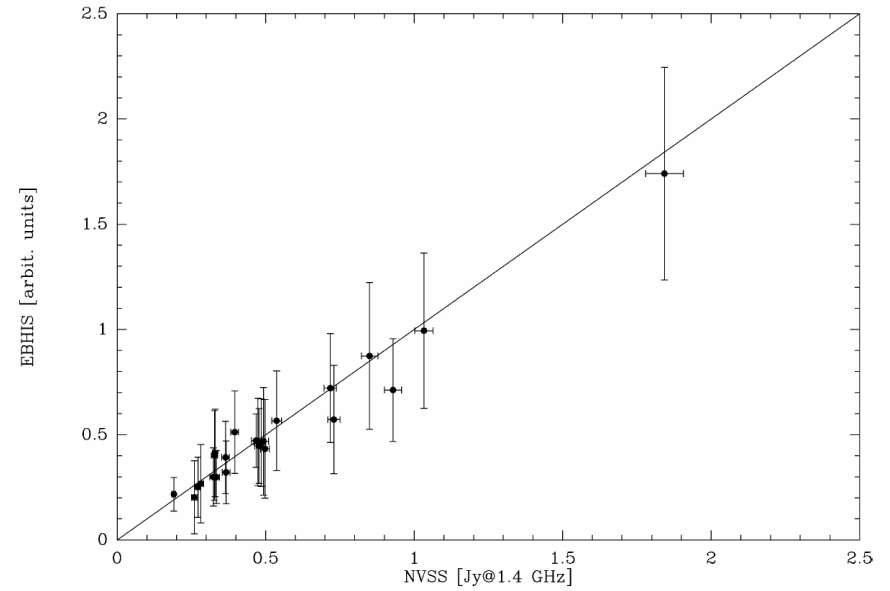
Allan variance-plot



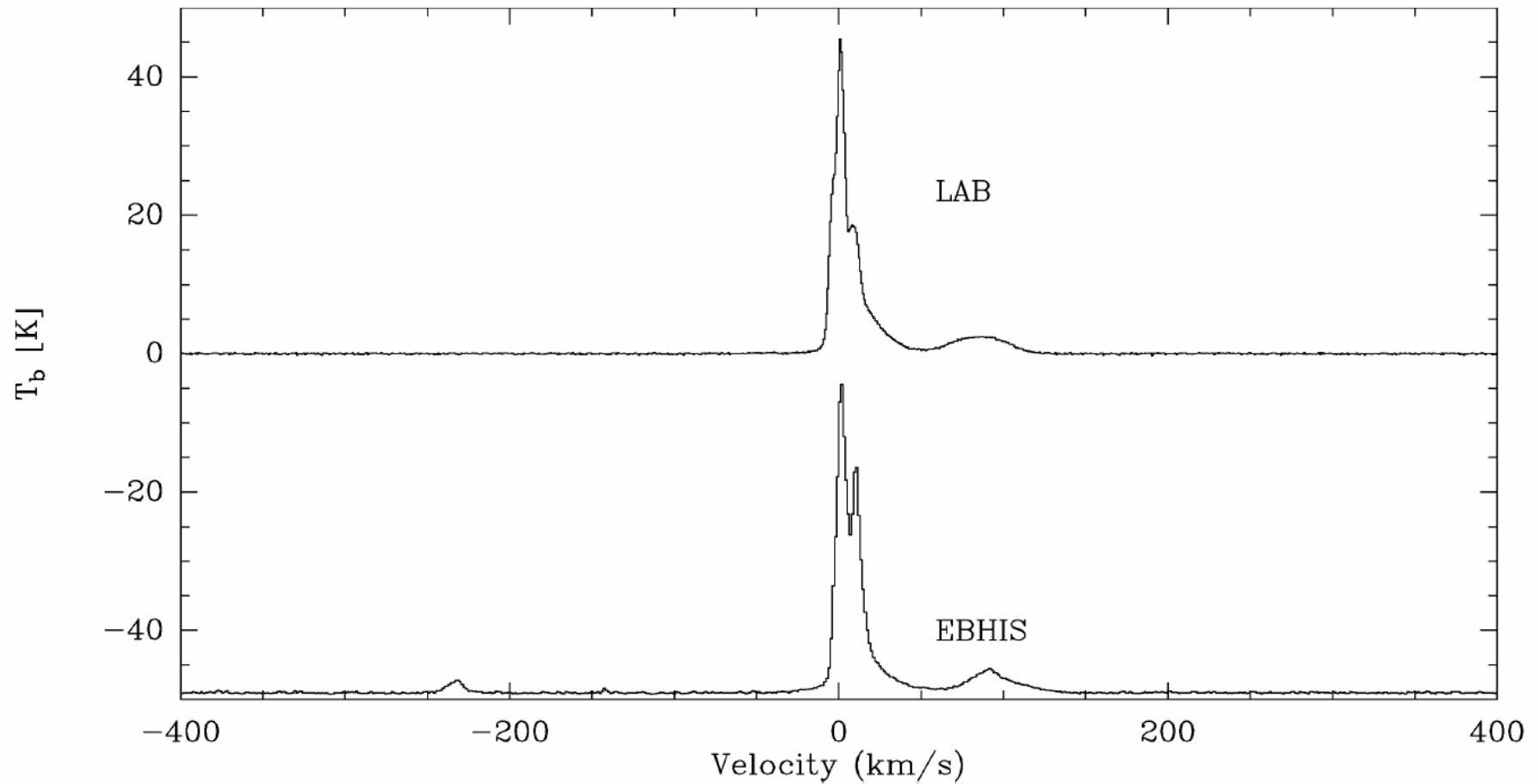
FPGA continuum information



Kerp et al. 2011

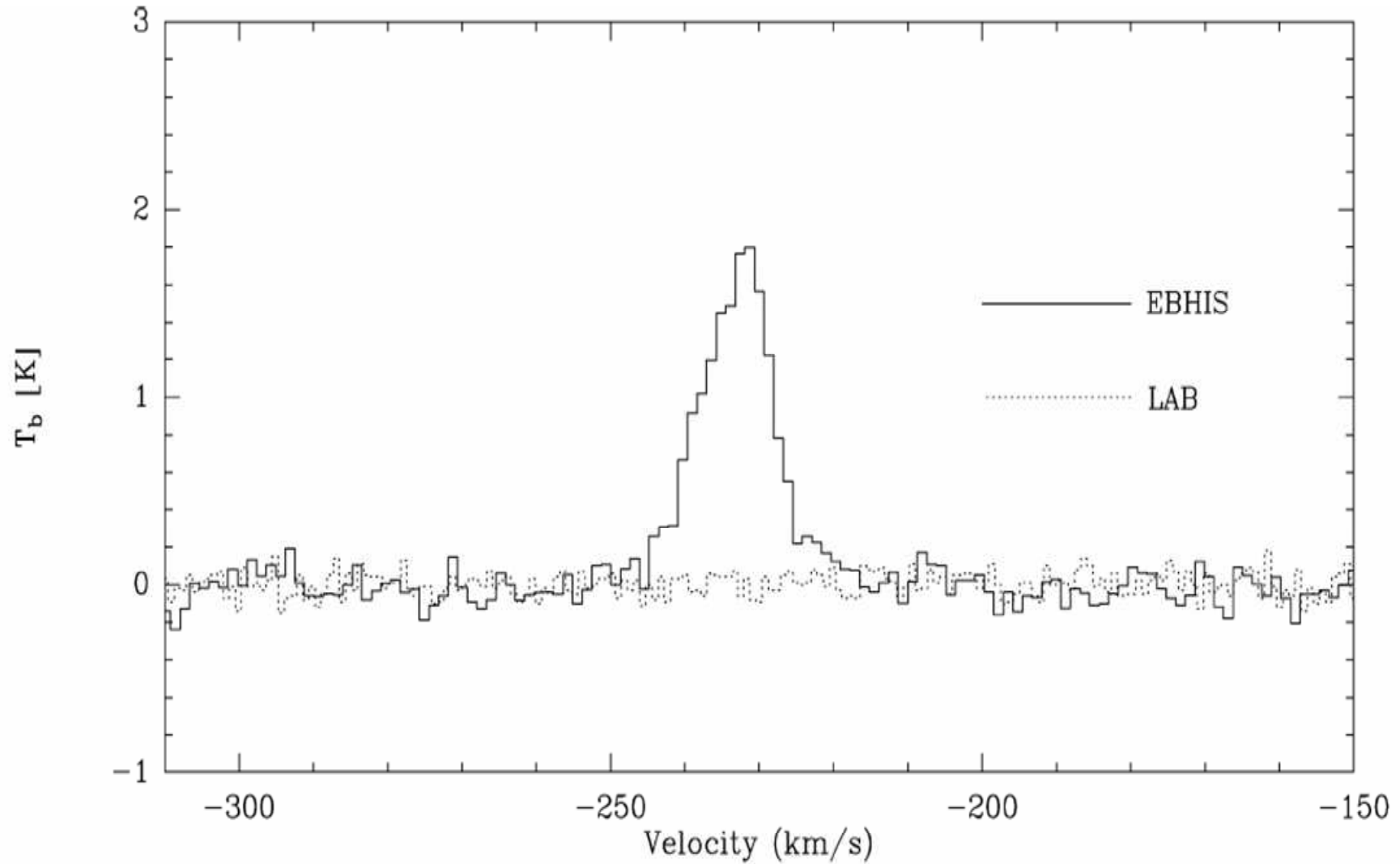


EBHIS: Milky Way data



Kerp et al. 2011

EBHIS: Milky Way data

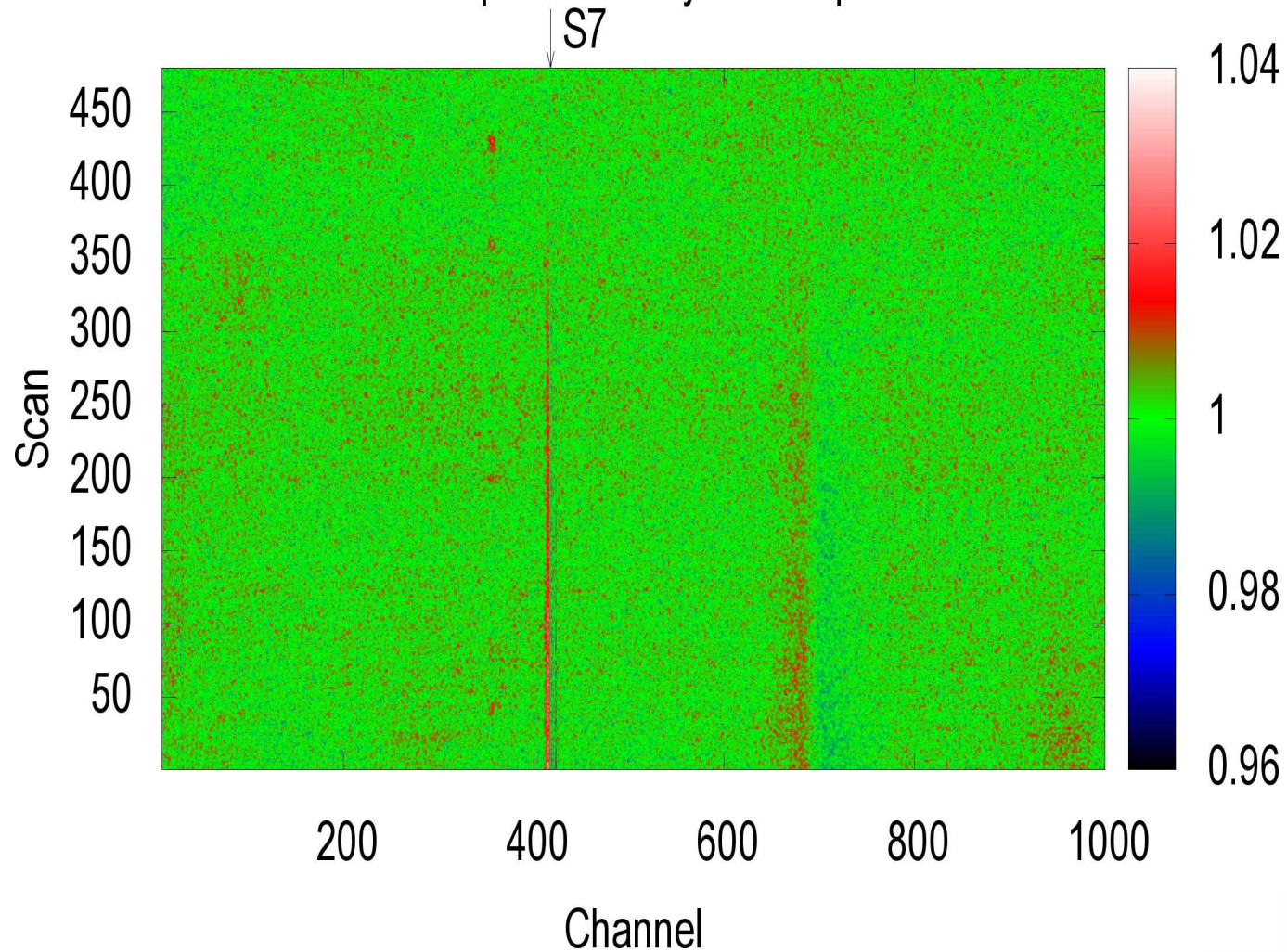


Kerp et al. 2011

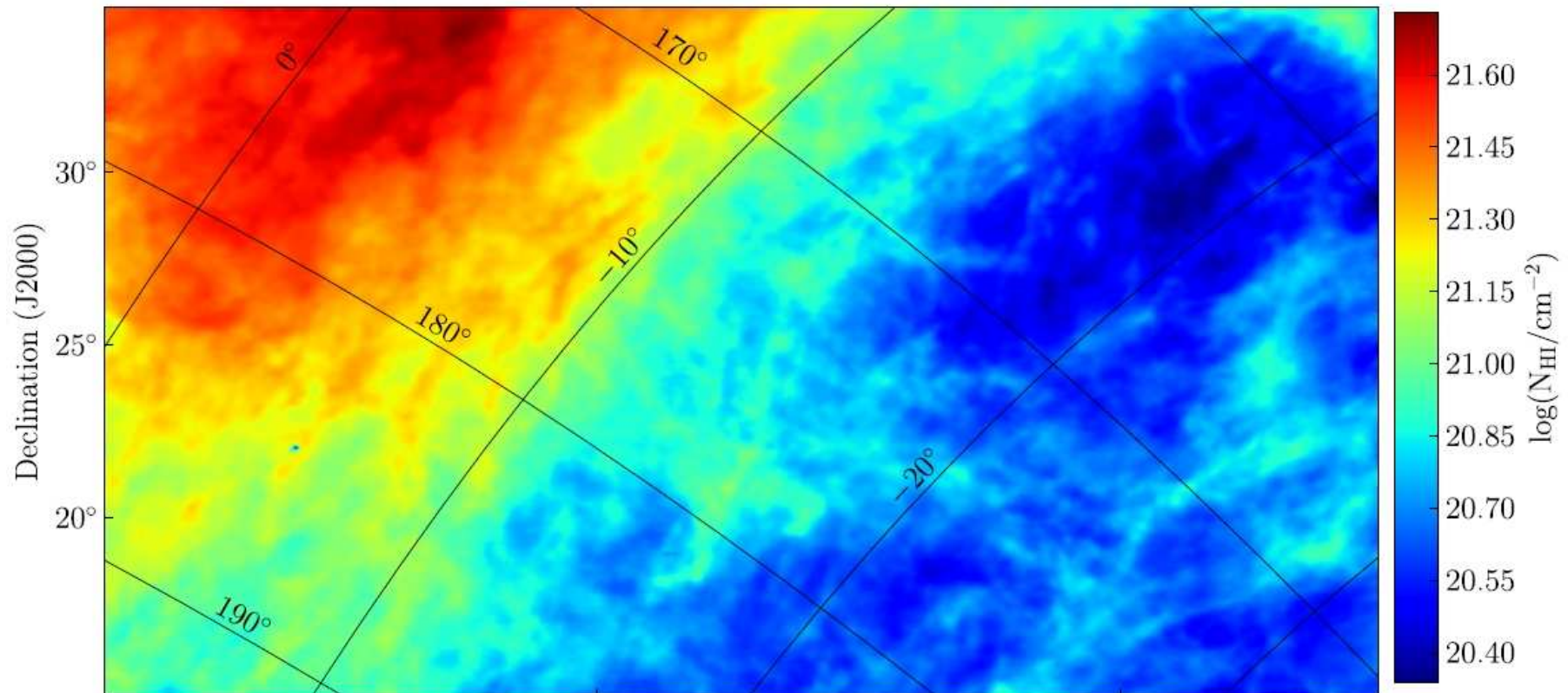
universität**bonn**l

RFI: Milky Way data

0.45 s dumps divided by mean spectrum

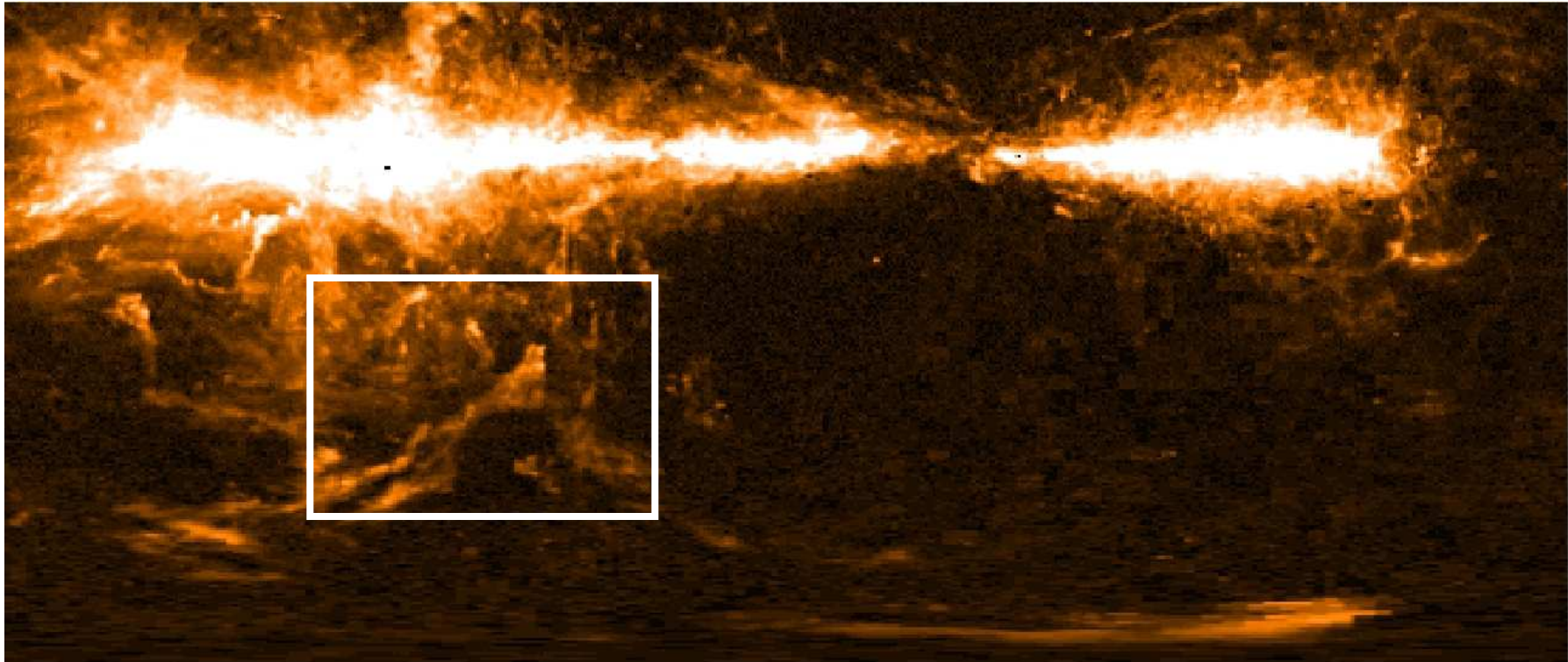


EBHIS Milky Way



$-30 \text{ km s}^{-1} < v_{\text{lsr}} < 0 \text{ km s}^{-1}$

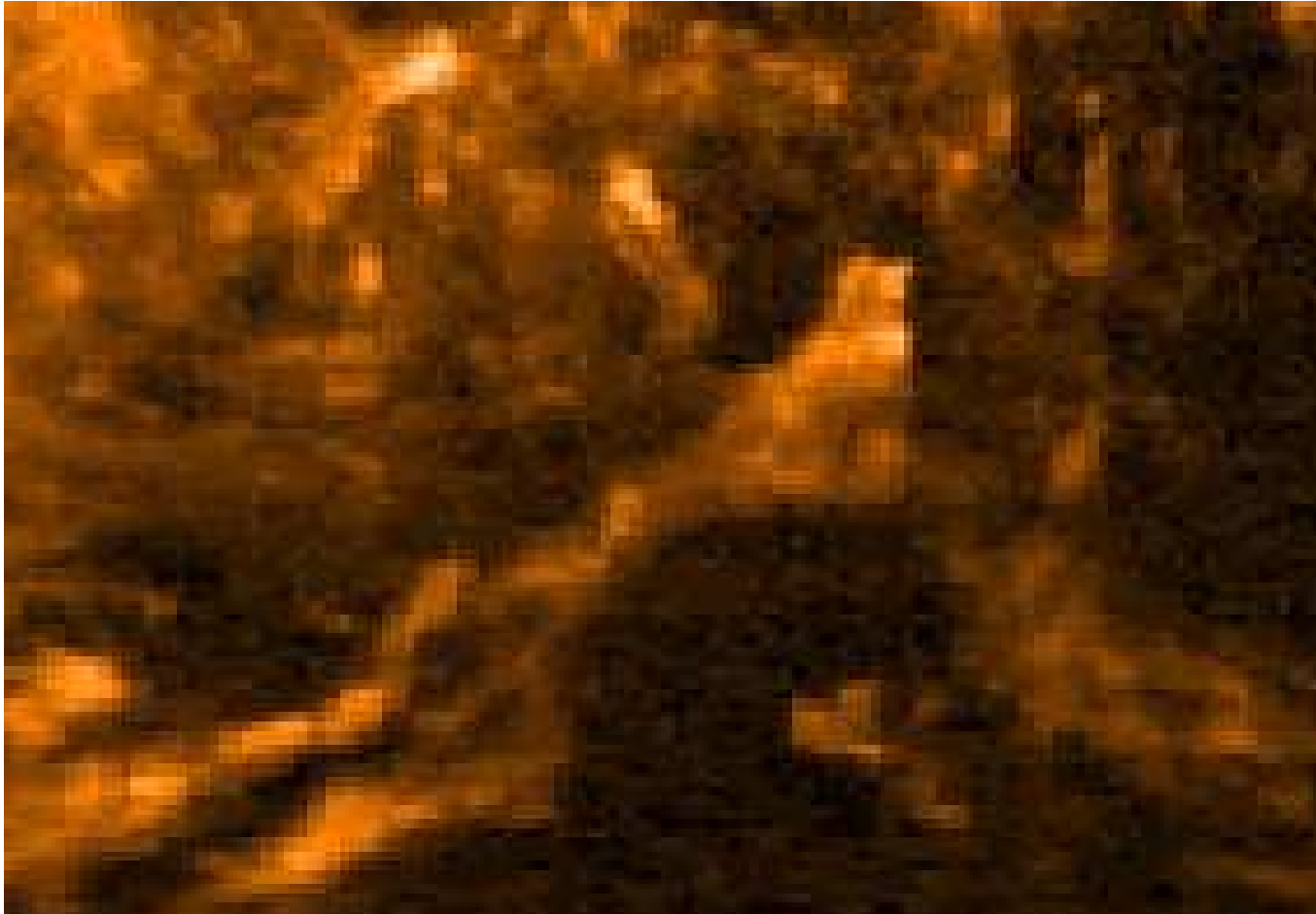
Leiden/Argentine/Bonn



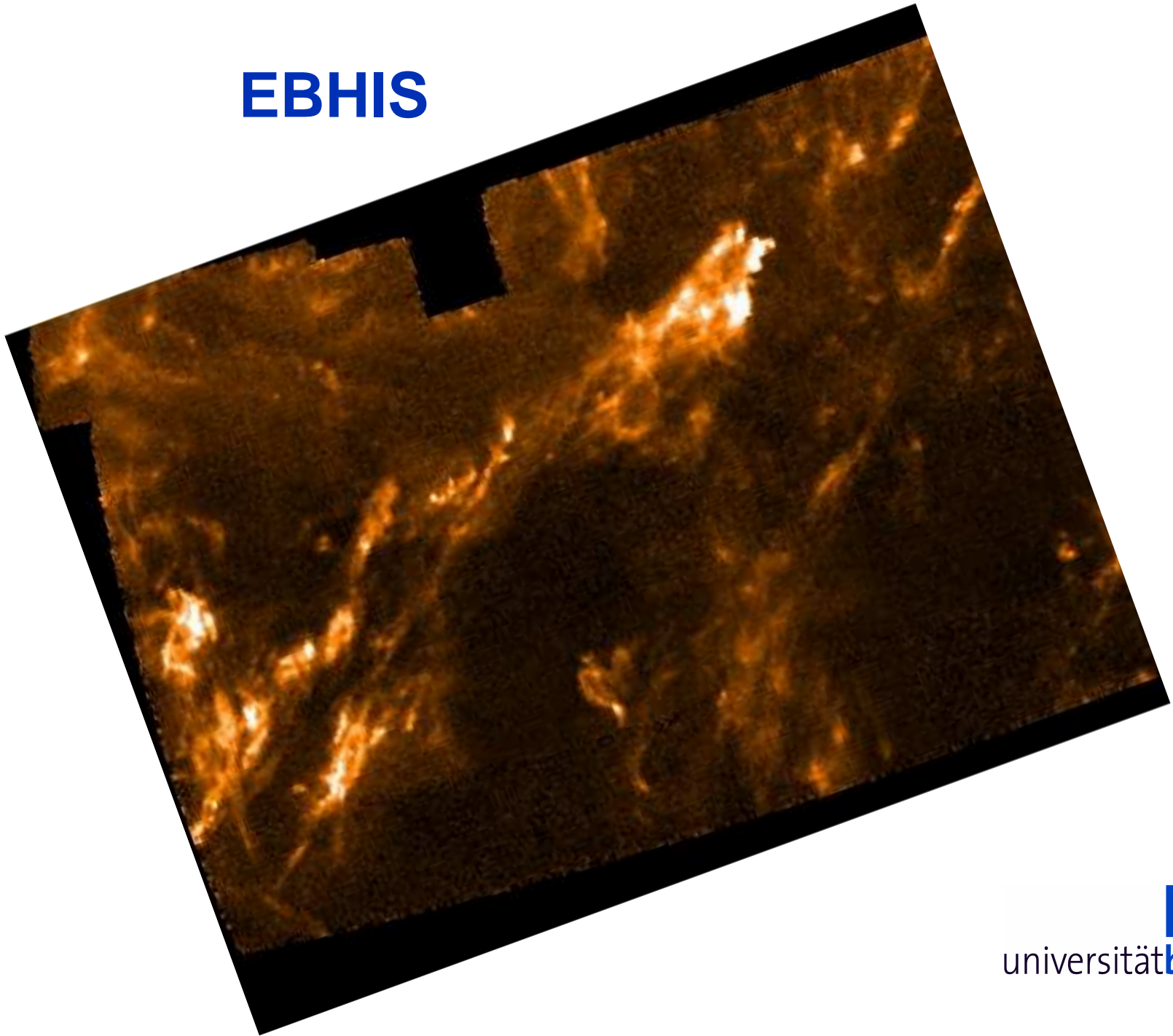
Starlink_GAIA::Skycat
/home/jk/EBHIS/data/Cent-big_han.fits(...,400) (Leiden/Argentine/Bonn Galactic HI
jk

GaiaTempCubeSection5.sdf
179.998909 0.249998
Jun 17, 2011 at 10:25:26

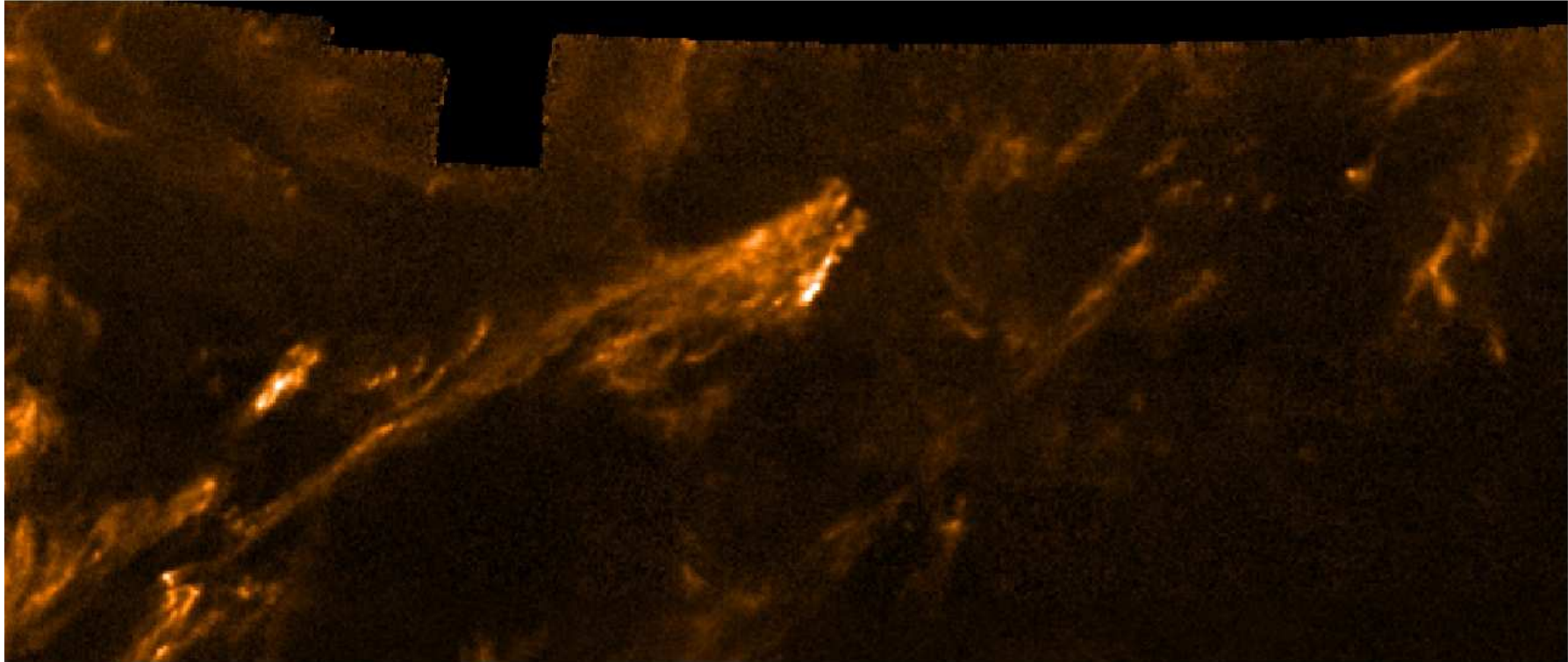
Leiden/Argentine/Bonn



EBHIS



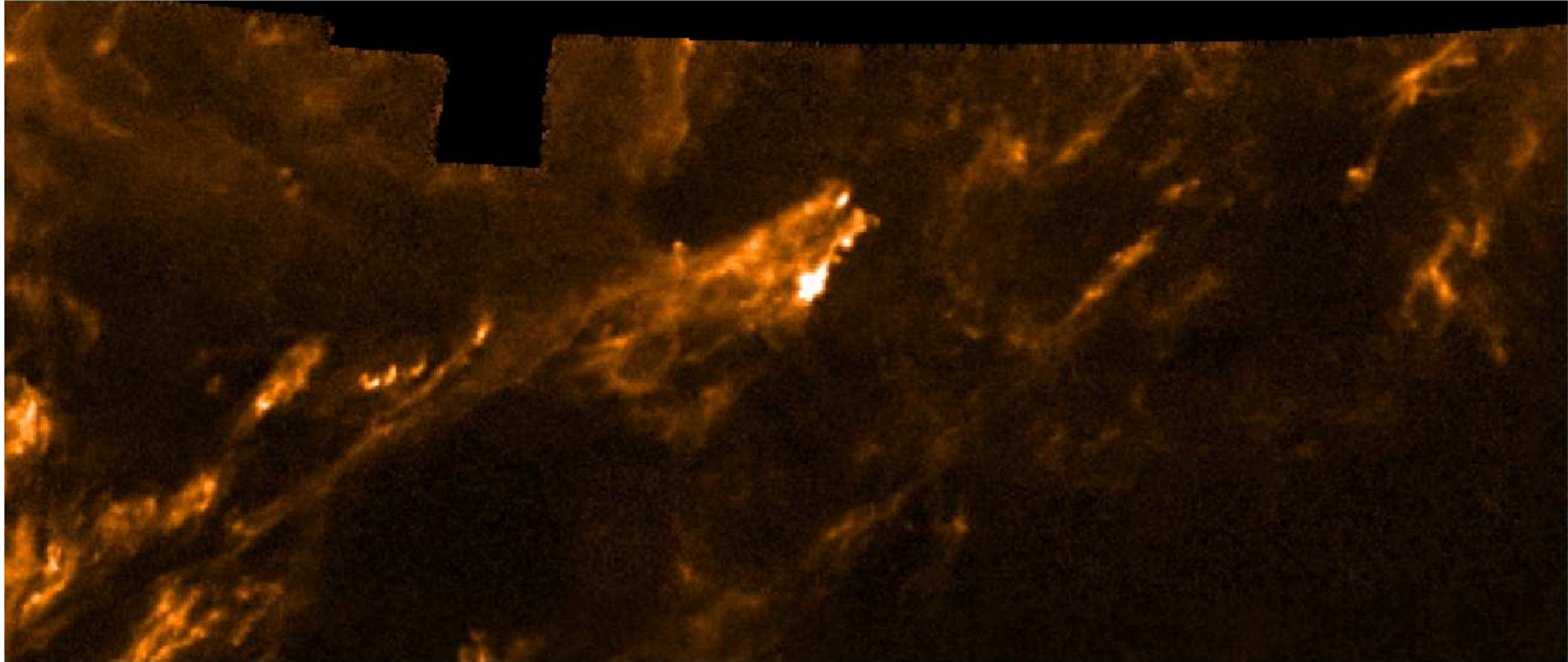
EBHIS: $v_{\text{LSR}} = -54 \text{ km s}^{-1}$



Starlink GAIA::Skycat
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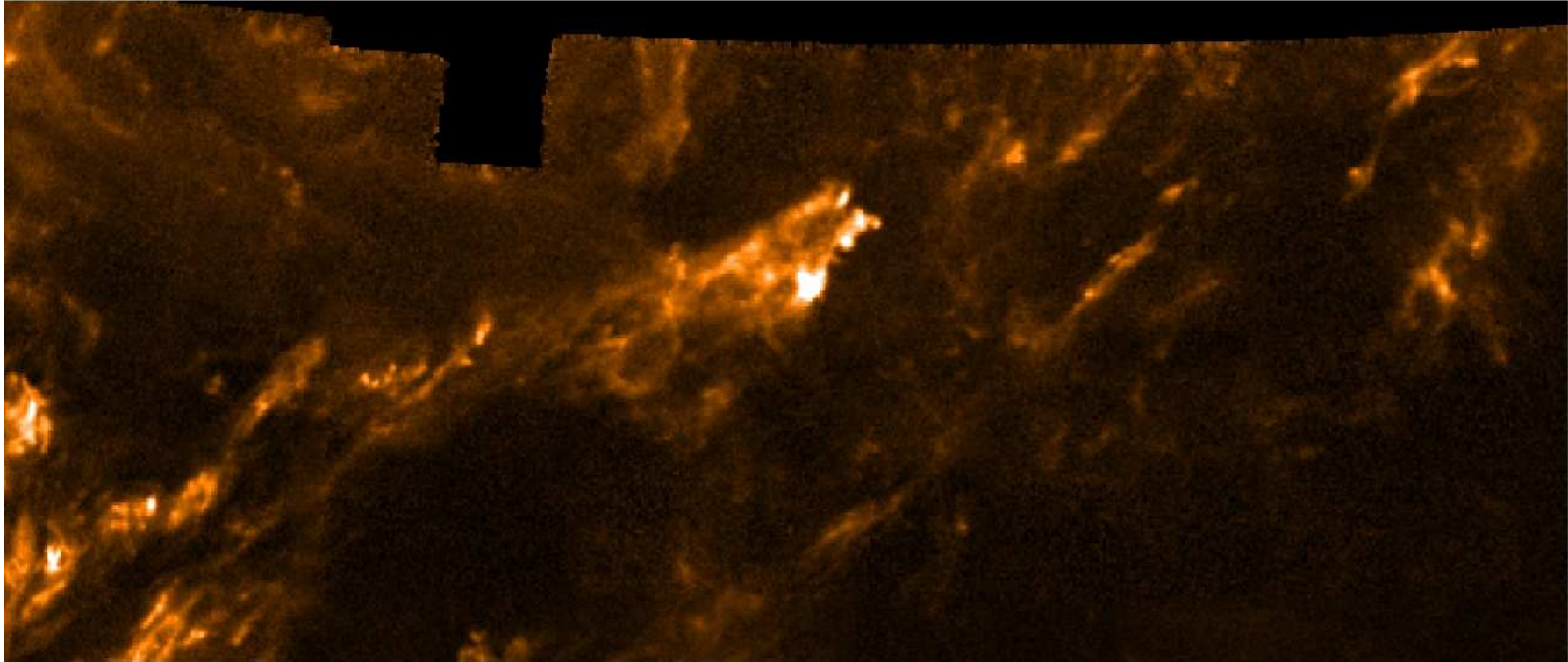
EBHIS $v_{\text{LSR}} = -52 \text{ km s}^{-1}$



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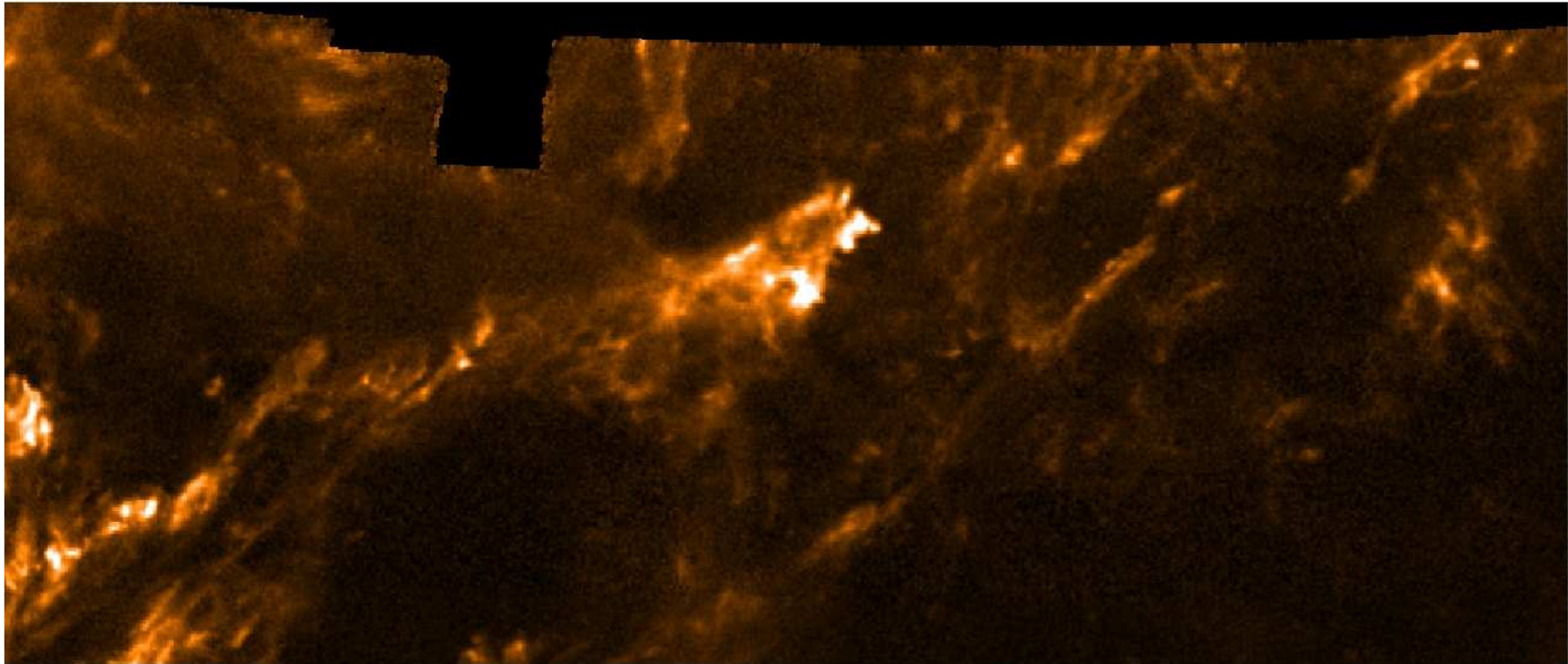
EBHIS $v_{\text{LSR}} = -50 \text{ km s}^{-1}$



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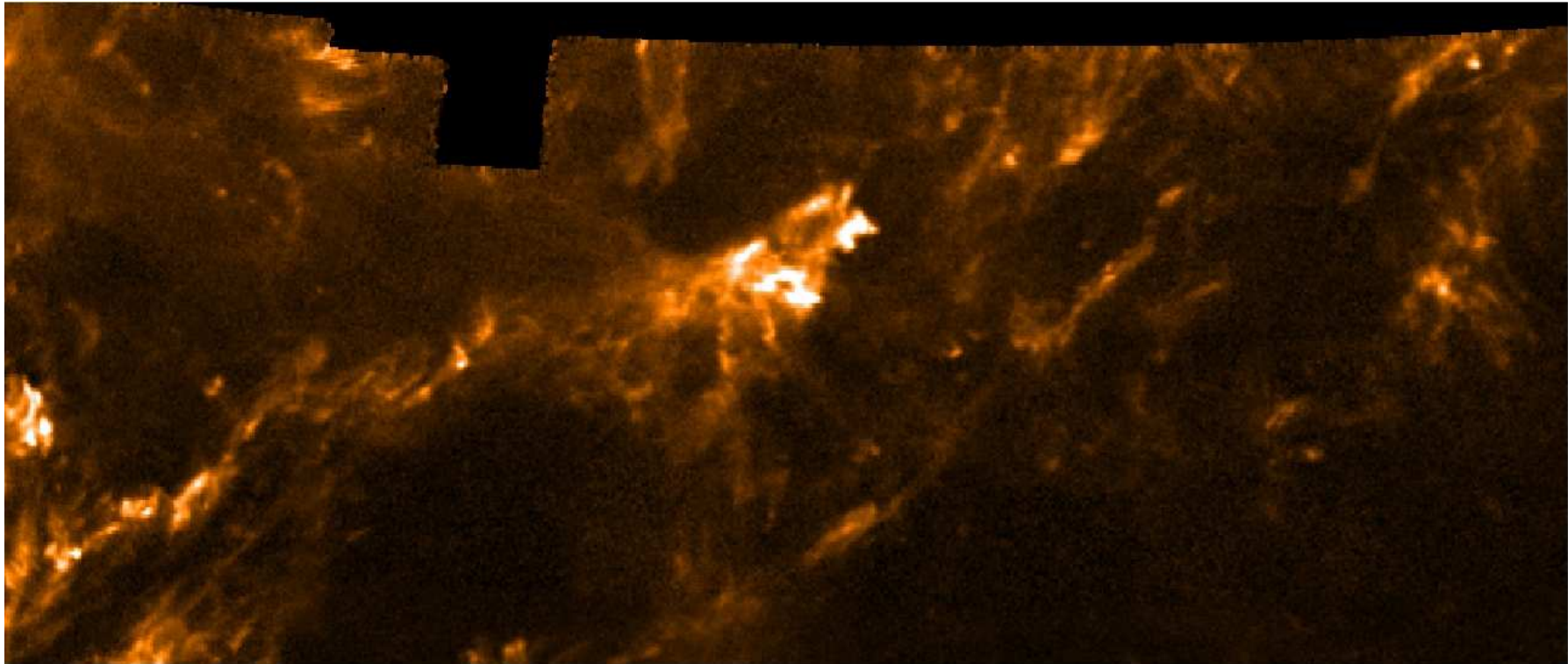
EBHIS $v_{\text{LSR}} = -48 \text{ km s}^{-1}$



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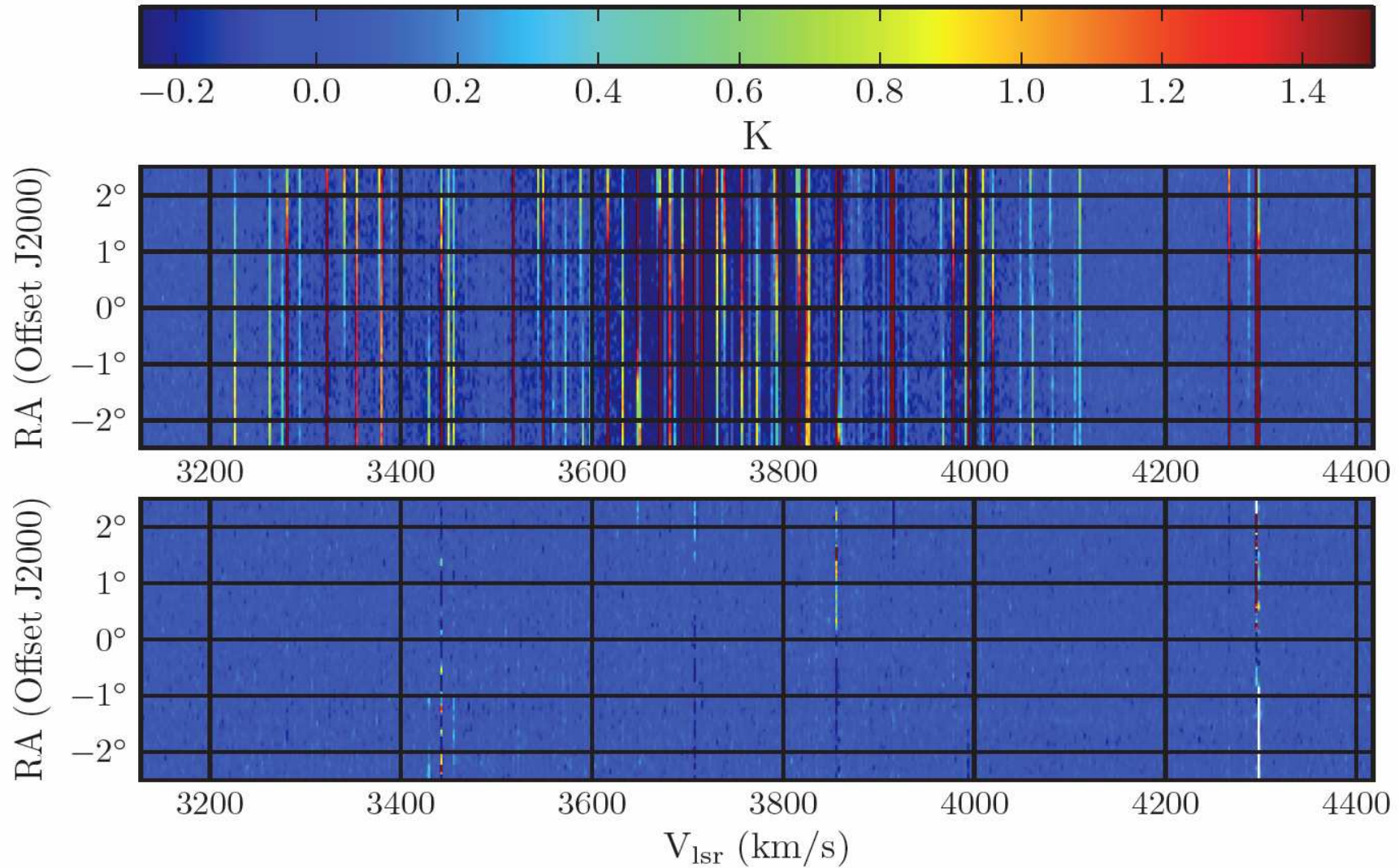
EBHIS $v_{\text{LSR}} = -46 \text{ km s}^{-1}$



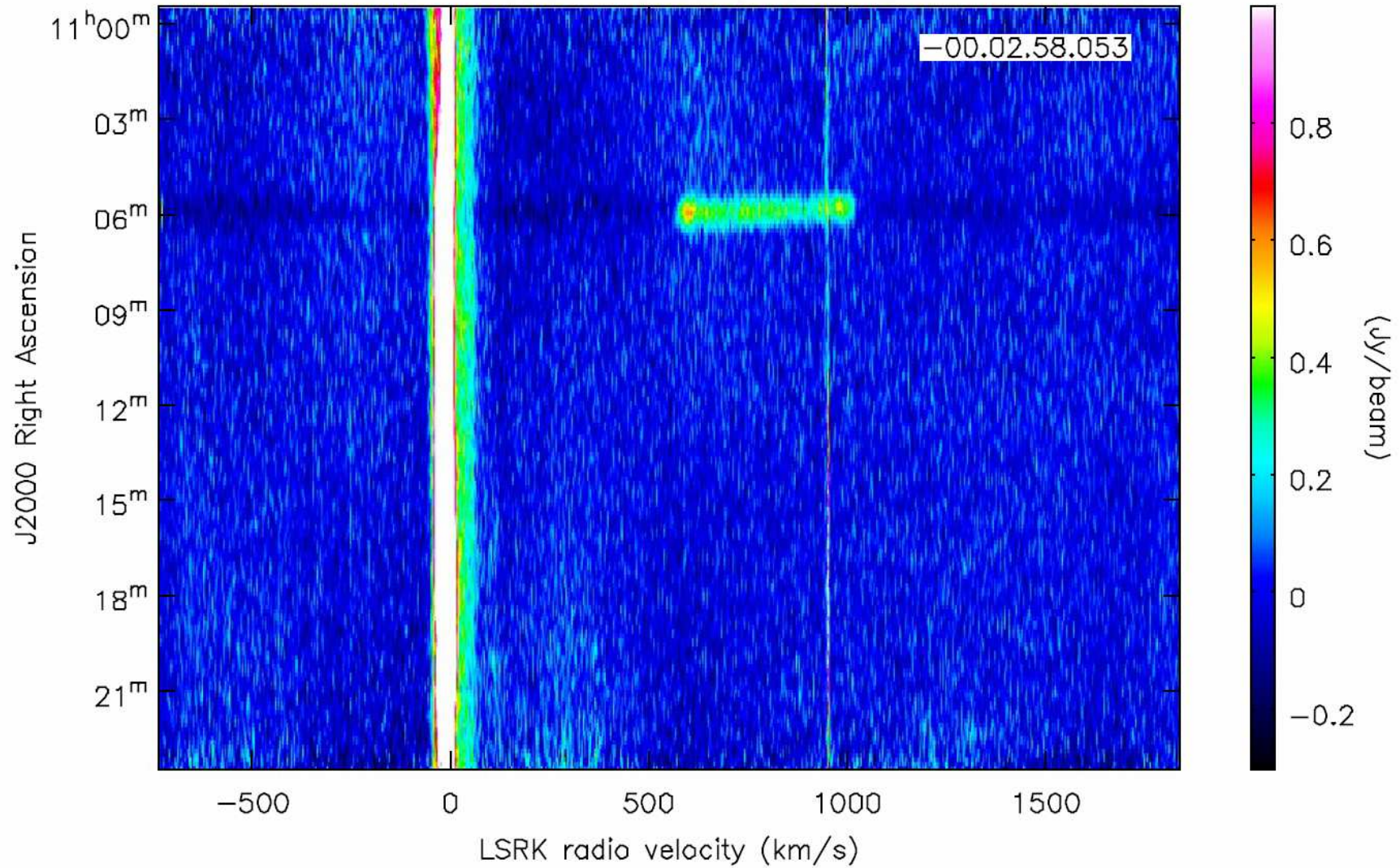
Starlink GAIA::Skycat
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jk

GaiaTempCubeSection7.sdf
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Jun 17, 2011 at 10:48:40

RFI: extragalactic data

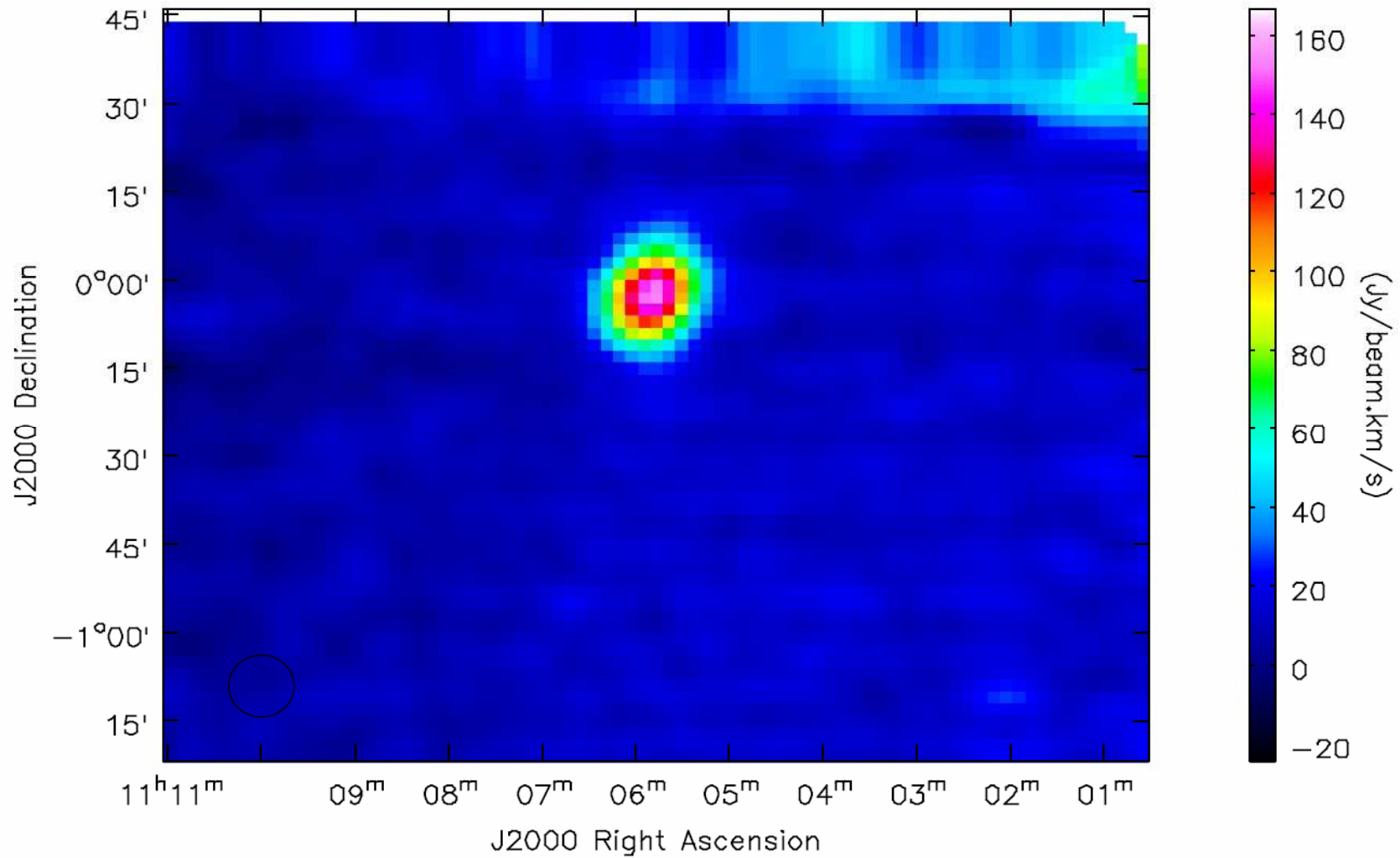


NGC 3521: basic data



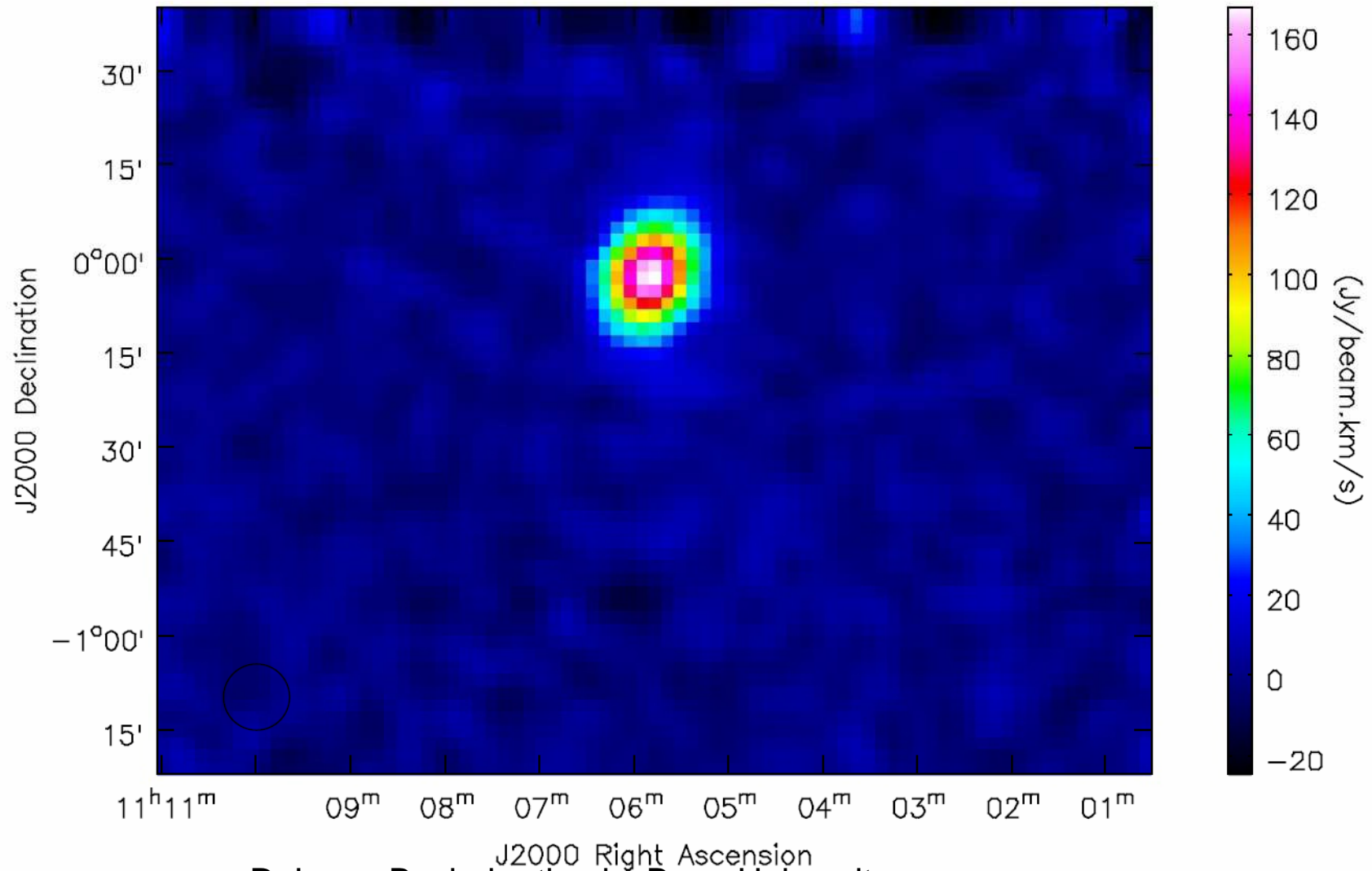
D. Lenz, Bachelor thesis, Bonn University

NGC 3521: basic data product



D. Lenz, Bachelor thesis, Bonn University

NGC 3521: enhanced data product



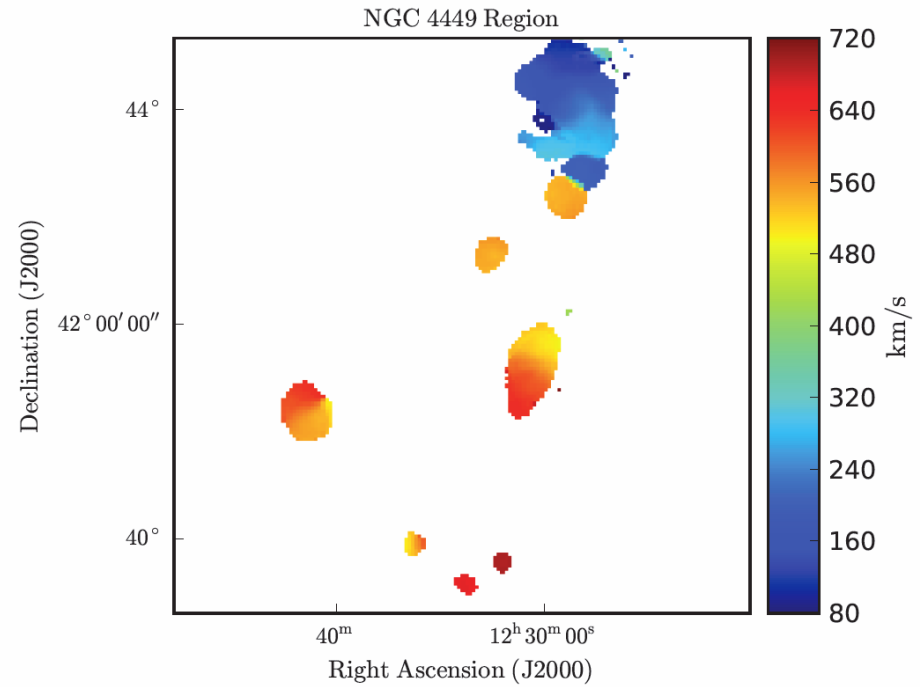
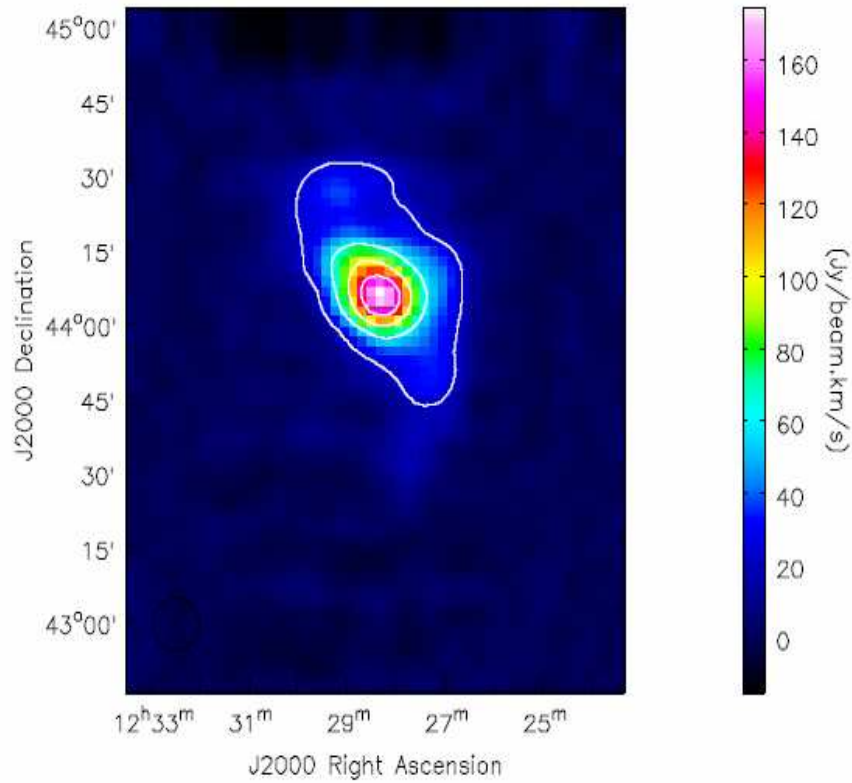
D. Lenz, Bachelor thesis, Bonn University

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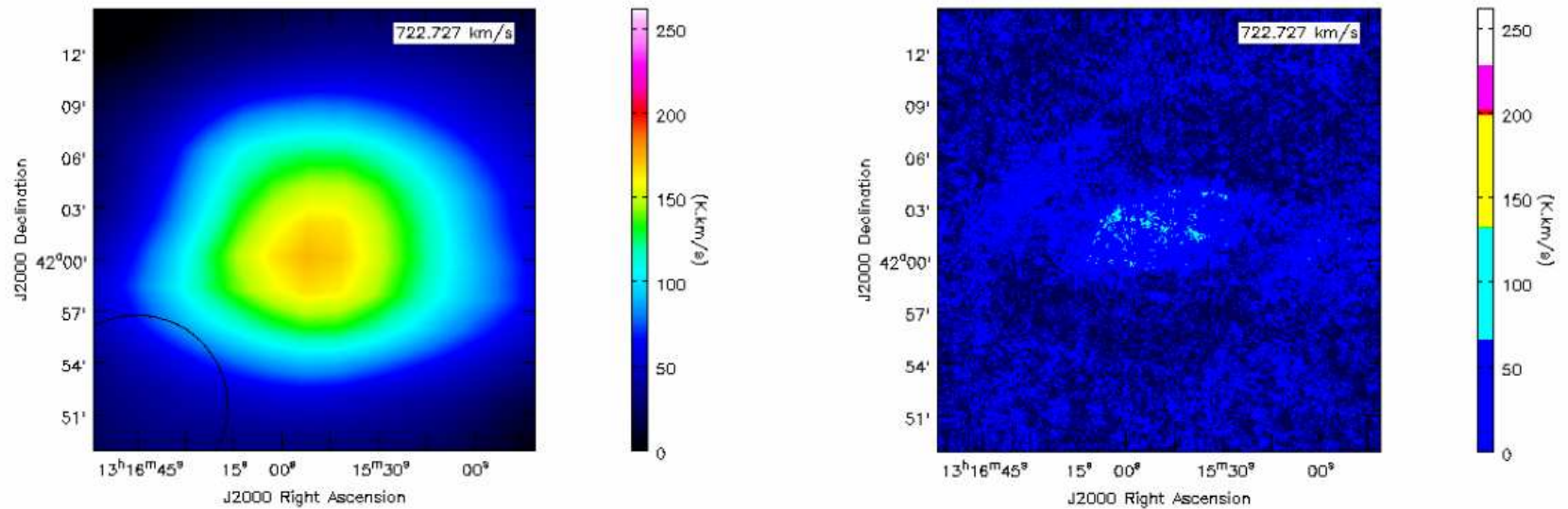
EBHIS: THINGS sub-sample

Galaxie	S_{THINGS} in Jy km s^{-1}	S_{EBHIS} in Jy km s^{-1}	M_{THINGS} in $10^8 M_{\odot}$	M_{EBHIS} in $10^8 M_{\odot}$	Abstand D in Mpc	Durchmesser L in Bogenminuten
DDO154	82,1	$95,2 \pm 7,6$	3,6	$4,2 \pm 0,3$	4,3	32
NGC2903	232,0	$224,7 \pm 12,8$	43,5	$42,0 \pm 2,4$	8,9	28
NGC3184	105	$109,8 \pm 9,5$	30,7	$31,9 \pm 2,8$	11,1	21
NGC3198	227,0	$239,1 \pm 10,3$	101,7	$107,4 \pm 4,6$	13,8	29
NGC3351	50,1	$63,7 \pm 12,8$	11,9	$15,3 \pm 3,1$	10,1	16
NGC3521	297,0	$290,0 \pm 14,4$	80,2	$78,4 \pm 3,9$	10,7	21
NGC3627	40,6	$27,4 \pm 17,5$	8,2	$5,6 \pm 3,6$	9,3	9
NGC4214	200,0	$297,2 \pm 5,1$	4,1	$5,9 \pm 0,1$	2,9	31
NGC4449 ⁺	263,0	$656,4 \pm 13,5$	11,0	$27,3 \pm 0,6$	4,2	59
NGC4736	78,1	$99,7 \pm 18,7$	4,0	$5,2 \pm 1,0$	4,7	23
NGC4826	41,5	$53,8 \pm 10,1$	5,5	$7,2 \pm 1,3$	7,5	26
NGC5055 ⁺	379,0	$509,5 \pm 18,7$	91,0	$122,7 \pm 4,5$	10,1	39
NGC628 ⁺	302	$510,2 \pm 6,0$	38,0	$64,2 \pm 0,8$	7,3	45
NGC7331	179,0	$177,0 \pm 20,0$	91,3	$90,3 \pm 10,2$	14,7	26
NGC925	232,0	$206,6 \pm 12,0$	45,8	$41,3 \pm 2,4$	9,2	27

NGC 4449

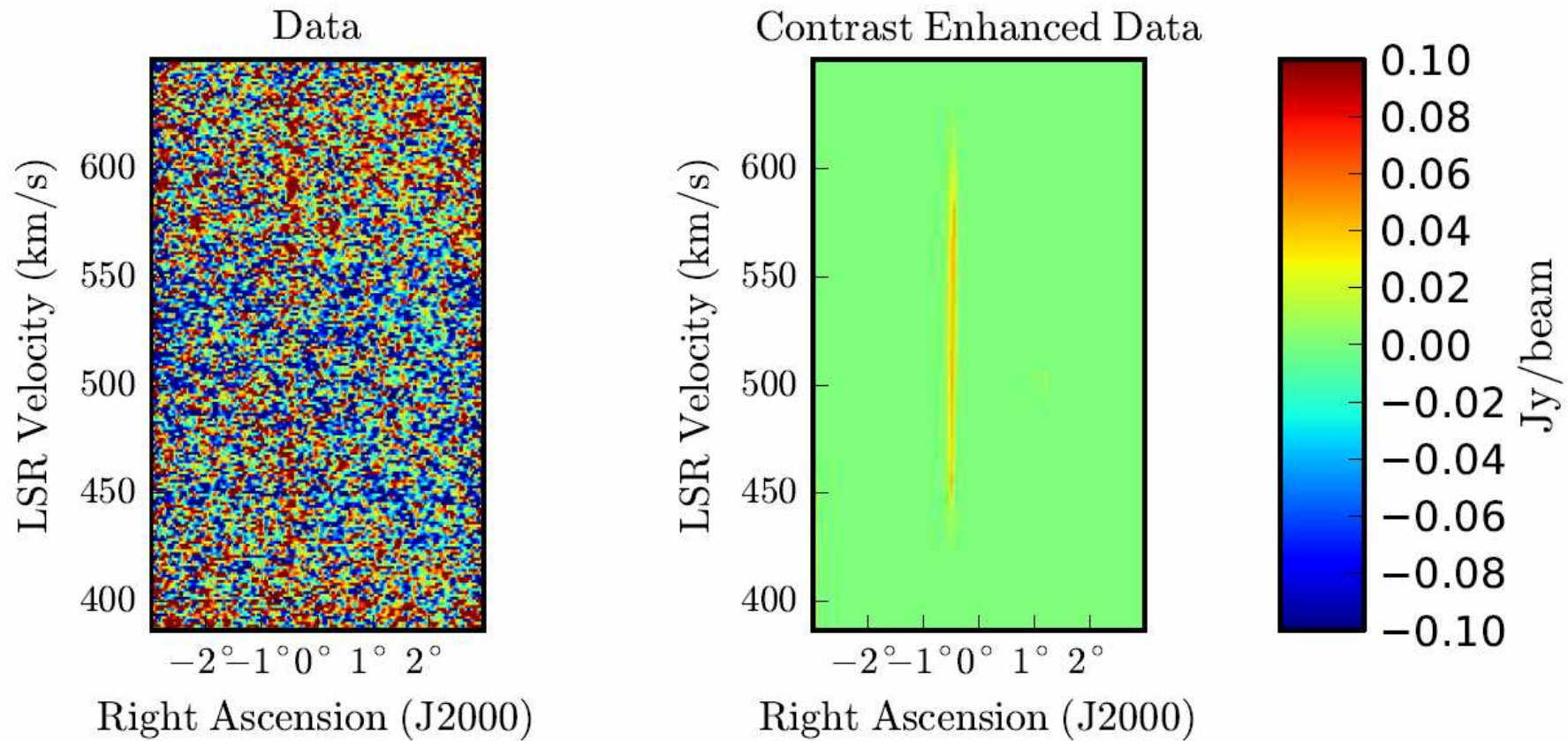


Short-spacing correction: NGC 5055



S. Faridani

Source finding: wavelets



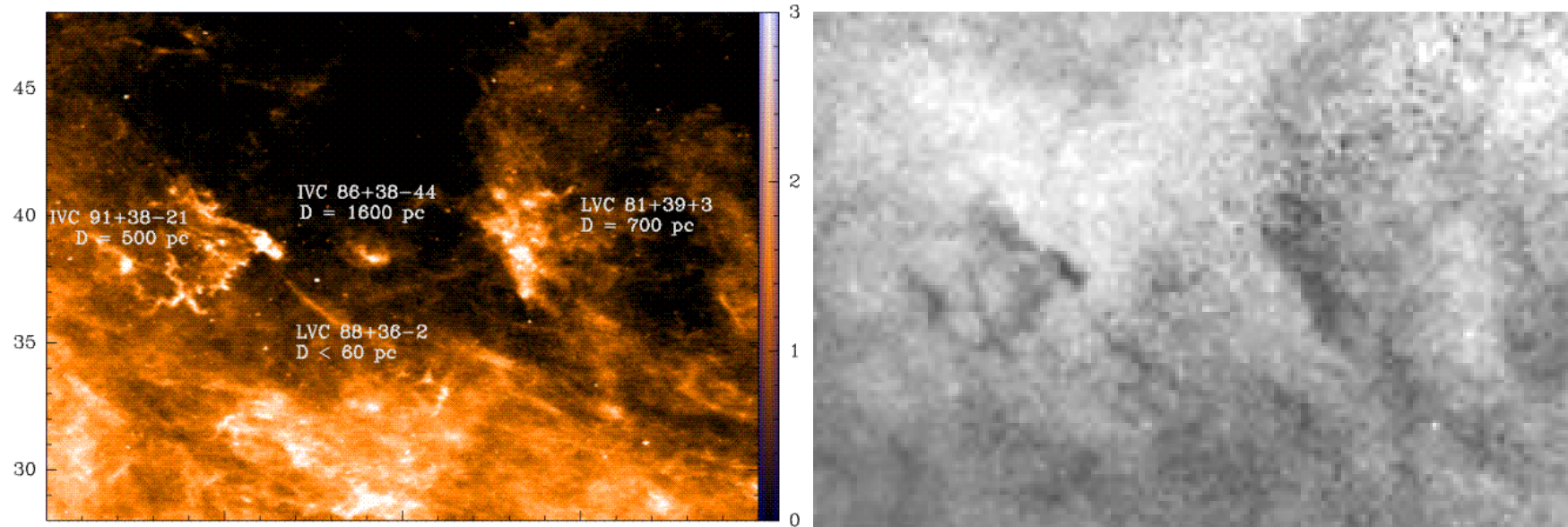
L. Flöer

Current status: timeline and etc.

- Project status
 - The project is continuously funded by the DFG
 - The area between -5° and $+30^\circ$ is almost completely observed
 - During summer/autumn 2011 the circumpolar areas are targeted
 - Data reduction and calibration are successfully tested
 - **First full-sky coverage end 2011/spring 2012**
 - Mass detection limit $6 \cdot 10^5 M_{\text{Sun}} \cdot \text{Mpc}^2$
 - First look data on request or <http://www.astro.uni-bonn.de/hisurvey>
- **Bright galaxy catalogue:** Lars Flöer
- **Short spacing correction and wide field imaging:** Shahram Faridani
- **Milky Way and environment:** Nadya Ben Bekhti, Peter Kalberla, Benjamin Winkel, Verena Darmstädter
- **MOU with Planck science working group on CIB and HI**
- **Member of the eRosita diffuse X-ray working group**

The Milky Way X-ray halo

$T \approx 0.12 \text{ keV}$



Neutral gas
distribution

0.25 keV ROSAT

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