STATISTICAL SURVEY OF UV COMPACT BURSTS OBSERVED BY IRIS

M. Litwicka [1], A. Berlicki [2], B. Schmieder [3]

(1) Space Research Centre Polish Academy of Sciences, WROCŁAW, POLAND
(2) Astronomical Institute,University of Wroclaw, POLAND,
(3) Observatoire de Paris-Meudon, LESIA, FRANCE

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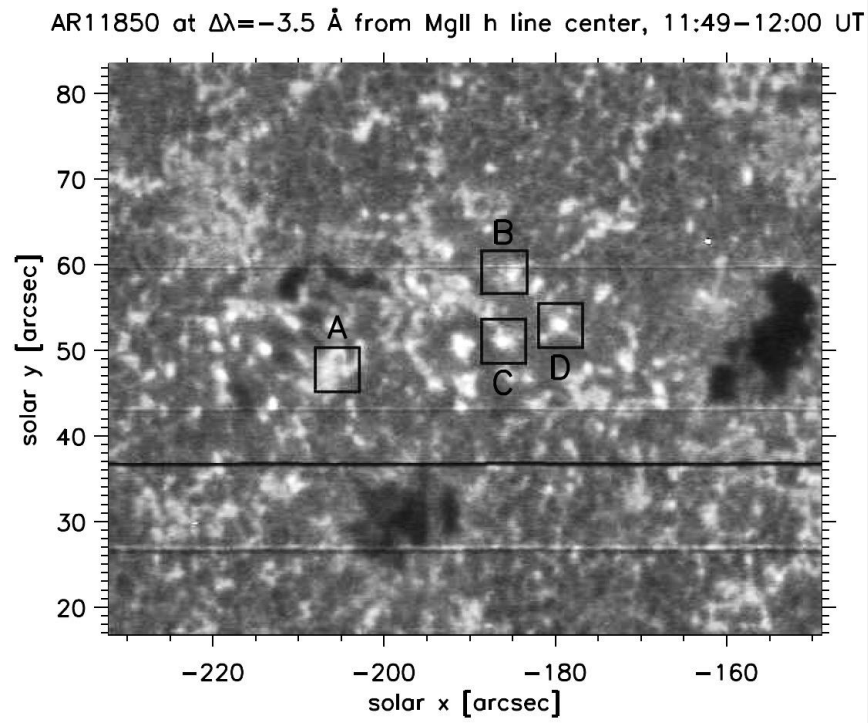
COMPACT BURST OBSERVED BY IRIS IN MG II h&k LINES

- Grubecka et al. 2016 - Height formation of bright points observed by IRIS in Mg II line wings during flux emergence
- Small (1’’) and intense short lifetime brightenings
- Diversity of CBs in Mg II h & k - Classification of CBs
- Additional emission in FUV lines - Si IV, C II and in Mg II UV triplet lines



Grubecka et al. 2016

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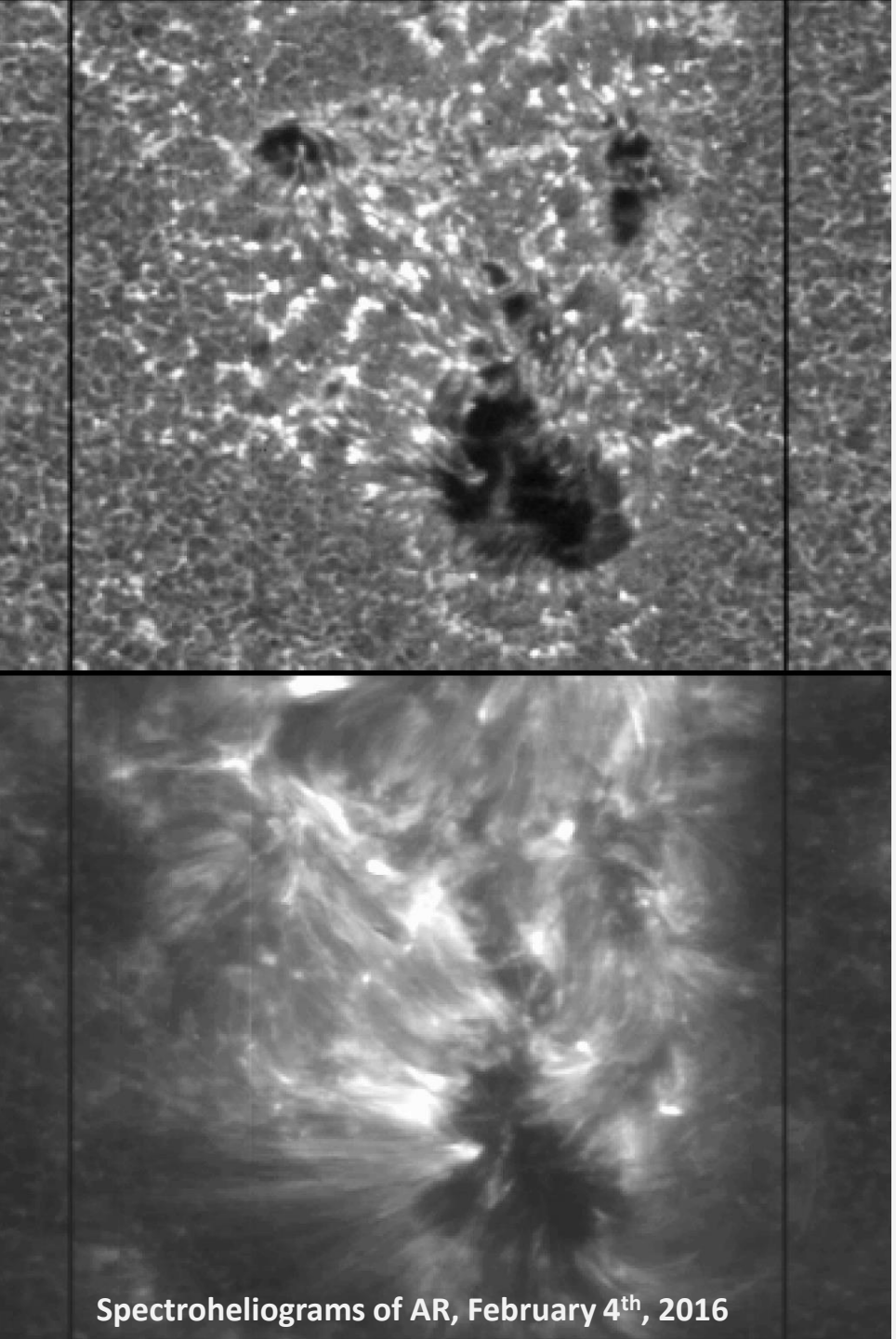


Spectroheliograms of AR, February 4th, 2016

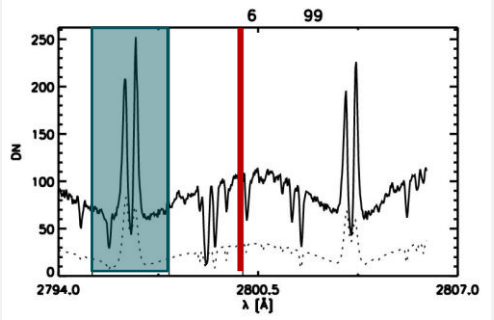
IRIS DENSE AND LARGE RASTERS: SEARCHING FOR COMPACT BURST

170 dense rasters observed between 2013 and 2018.

3 search criteria for algorithm based on intensity contrast in different wavelengths:

1. CBs with greater then 2 contrast at 2800 Å: **1835 CBs**
2. CBs with greater then 9 average intensity contrast in range -1.25, +1.25 Å): **499 CBs**
3. CBs with greater than 6.5 contrast in Mg II k line and simultaneously greater then 1.5 contrast at 2800Å: **616 CBs**

2950 CBs found - after verification of automatically found 2950 CBs **we accepted 2053 CBs** for further analysis.



Verification:
cosmic rays,
compact structure and size,
repeated events,
micro-flare type events

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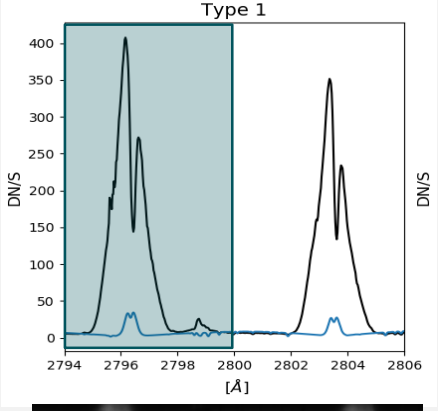
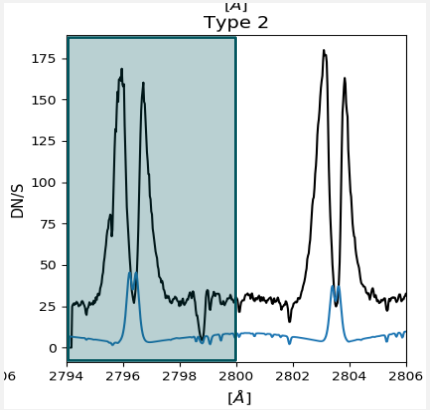
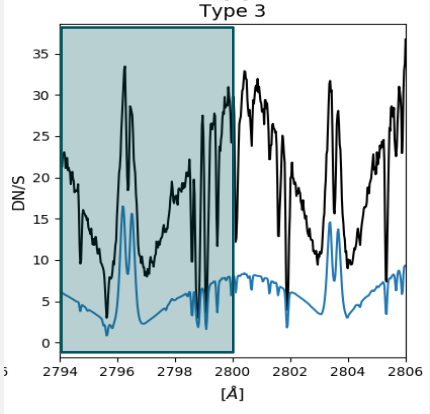
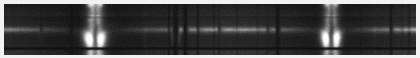
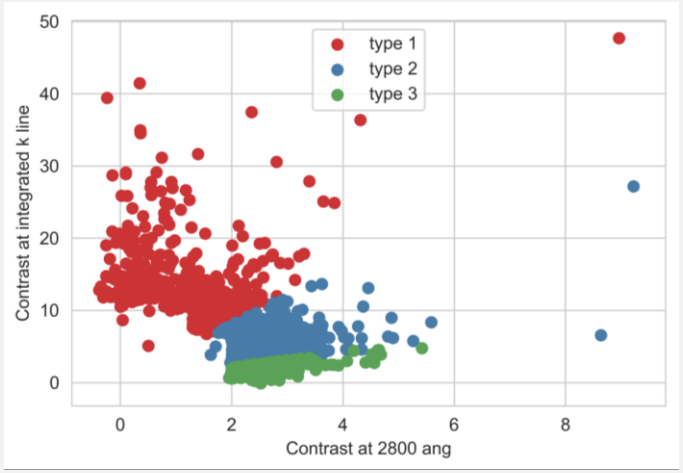
PARAMETERS OF THE MG II K LINE CLASSIFICATION OF COMPACT BURSTS











Analyzed parameters:

C_C - Line center intensity contrast

C_P – Average peak intensity contrast

C_L – Line integrated intensity contrast (-1 Å ,+1 Å)

$C_{+1Å}$ - Contrast at +1 Å from k line

$C_{2800Å}$ - Contrast at 2800 Å

C_{TW} - Average contrast at wing of Mg II UV triplet

C_{TL} - Contrast at center Mg II UV triplet

FWHM - full width at half maximum of k line

Type 1 – CBs with strong emission only in Mg II line peaks or in line center : 27% (556) of CBs

Type 2 – CBs with emission observed both in the line peaks and line wings (emission raised in the whole spectral range) : 53% (1096) of CBs

Type 3 – CBs showing emission only in far wings of Mg II h and k lines : 20% (401)

Classification of CBs is based on the relation between emission in the wing of k line (at 2800Å) and emission in the k line in the range 2795.35–2797.35Å ($C_{2800Å}$ / C_L) . This division reflects formation heights.

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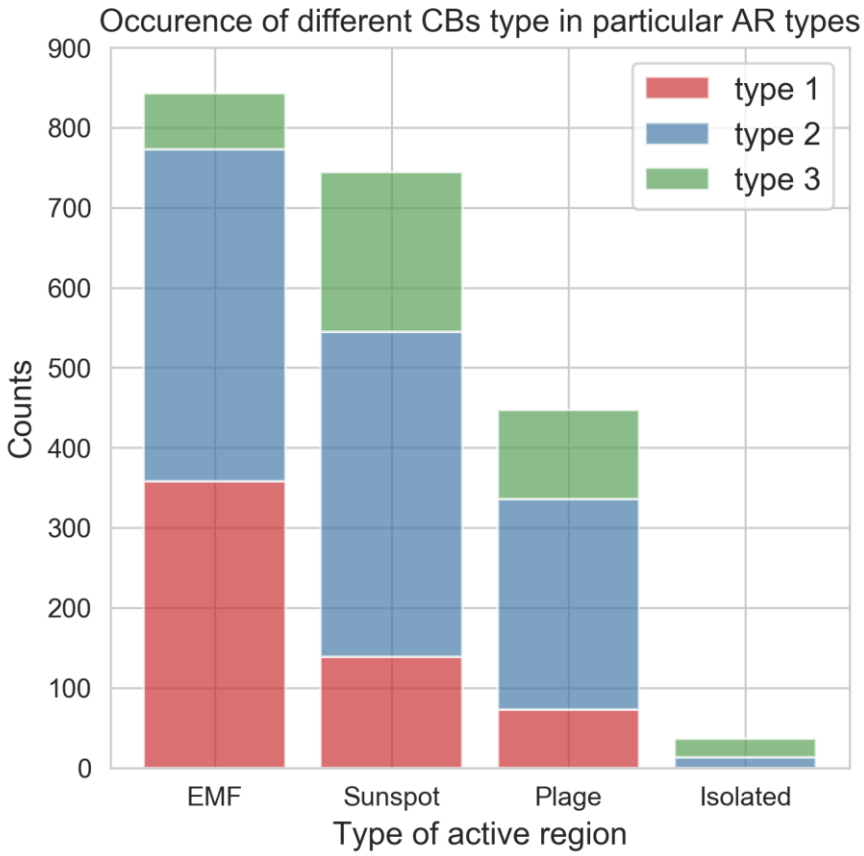

OCCURRENCE OF CBS IN DIFFERENT TYPES OF ACTIVE REGIONS

- We determined 4 main types: emerging flux region (EMF), areas close to the penumbra sunspot, plage region and so-called isolated CBs.
- EMF **827** events
- Sunspot areas **744** CBs
- Plages **446** CBs.
- Isolated CBs **36**
- EMF produced more energetic events, with broader line profiles, stronger triplet and FUV emission.

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ELLERMAN BOMBS, IRIS BOMBS, SOLAR UV BURST

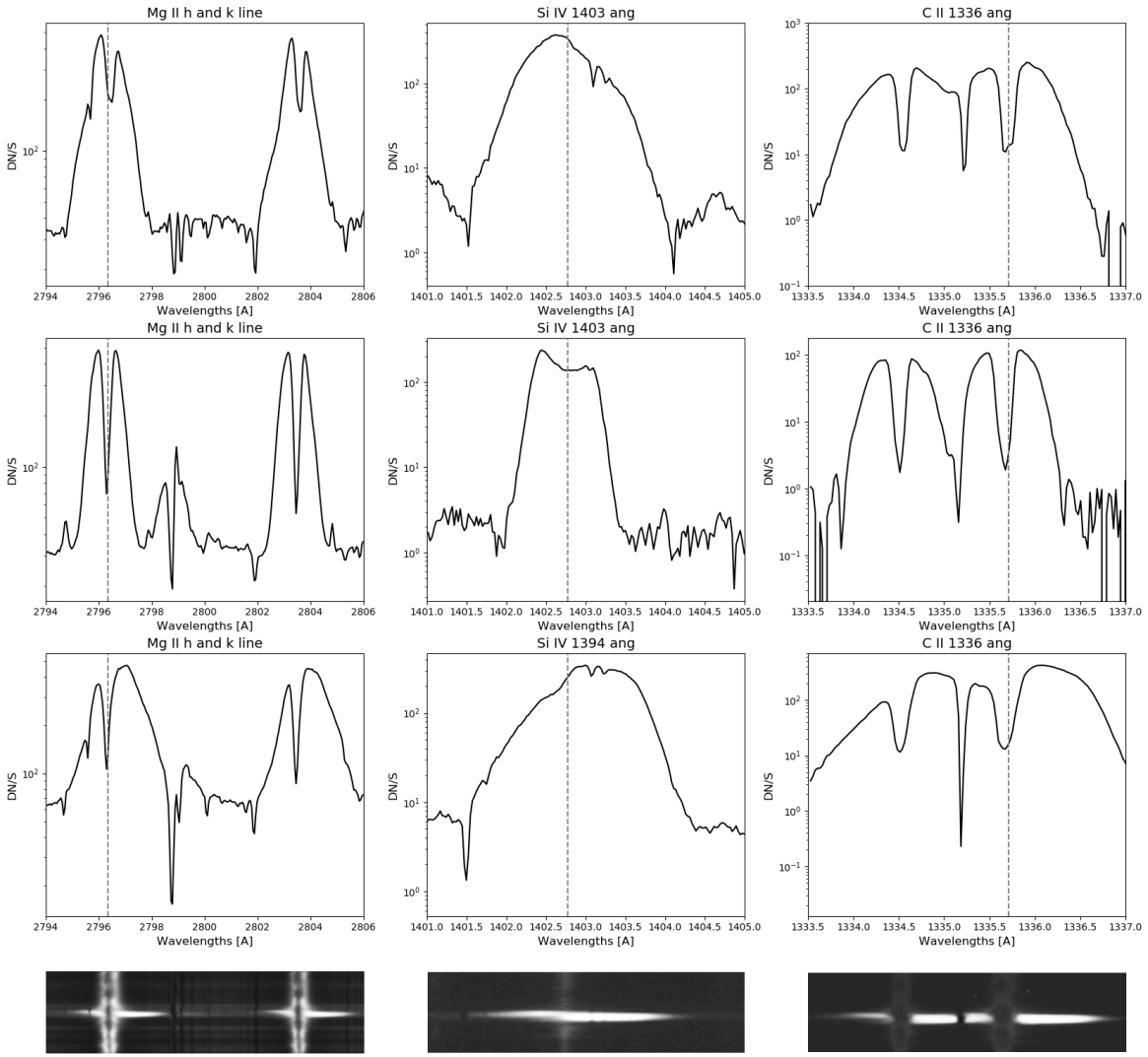
45% of CBs – emission in Si IV lines

67% of CBs – emission in C II

Type 1: 91% of CBs have emission in SI IV and 99% in CII

Type 2: 31% of CBs have emission in SI IV and 66% in CII

Type 3: 8% of CBs have emission in SI IV and 26% in CII



273 Ellerman Bombs, 125 solar ultraviolet burst, 49 IRIS bombs.

- 29 CBs are EBs and IBs simultaneously, which is 10.6% of EBs and 59% of Ibs
- 51 CBs are EBs and UV burst simultaneously, which is 19% of EBs and 41% of UV burst.

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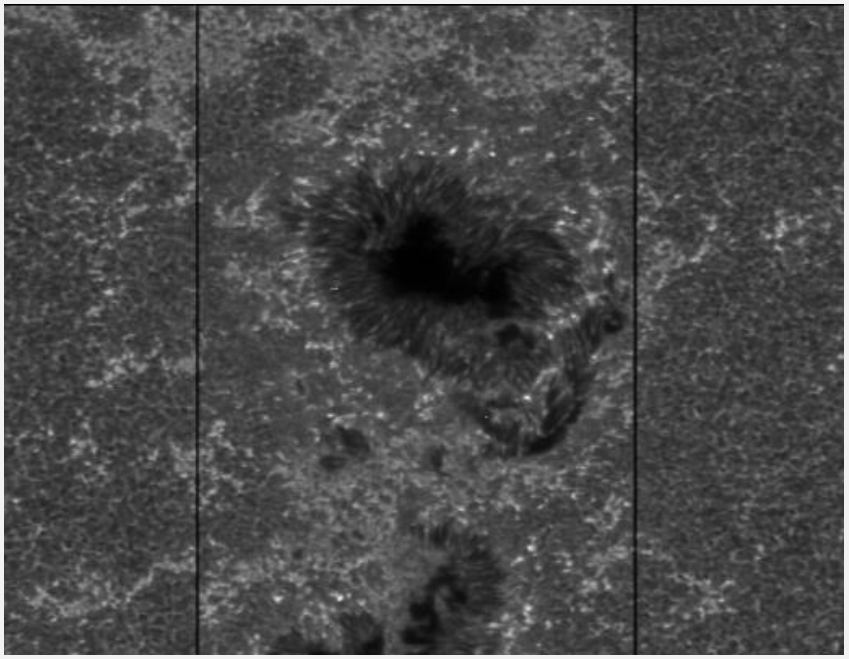
CONCLUSIONS

- 2053 CBs was found
- Classification of CBs into 3 groups – connection with formation height
- Analysis of common emission in Mg II h&k lines and Si IV, C II
- Searching for Ellerman bombs and solar UV burst, which constitute only a small fraction of all CBs (EBs – 13% , solar UV burst 6% and IBs – 2.4%)



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