Guide to master STAGES/COMBO/MIPS catalogue flags

Meghan Gray (meghan.gray@nottingham.ac.uk)

November 24 2008

This document is a quick-start guide to the STAGES master catalogue, available from `http://www.nottingham.ac.uk/astronomy/stages/astro_data.html`

1 Introduction

The STAGES survey is comprehensively described in Gray et al 2008 (MNRAS, accepted), and that paper is considered the definitive guide to the survey, data reduction, and catalogue creation. We **strongly** recommend that users consult the paper before attempting to use the catalogue. However, this document is intended to serve as a as an introductory guide to the catalogue and demonstrate some example uses.

For each object within the union of the footprints of the STAGES and COMBO-17 surveys, the catalogue contains entries (where applicable) with the following information:

- results from SExtractor on the ACS images
- results from GALFIT (Sérsic profile fitting) on the ACS images
- COMBO-17 photometry, classification, photometric redshift
- stellar mass
- UV and 24 micron derived star formation rate
- selection flags (for automatic selection of different populations, see below)

Table B1 of Gray et al.(2008) contains listings of all 194 columns available in the catalogue.

2 Sample Flags

The columns `STAGES_FLAG, COMBO_FLAG` and `MIPS_FLAG` are provided for convenience in selecting various populations of objects according to their properties in the HST/ACS, COMBO-17, and Spitzer 24μm observations, respectively. Users should be aware of the footprints of the various observations (see Fig. 1 of Gray et al. 2008) and the cross-matching applied.

We reproduce Table B2 of Gray et al. (2008) below:

Flag	Value	Definition	N
`STAGES_FLAG`	0	not in STAGES footprint (only in COMBO-17)	6577
	1	in STAGES footprint, but not detected by STAGES (only in COMBO-17)	6497
	2	detected by STAGES, but not HST extended source	5061
	3	HST extended source, but GALFIT ran into constraint	16123
	4	HST extended source, but GALFIT successful	54621
`COMBO_FLAG`	0	not in COMBO-17 footprint (only in STAGES)	1271
	1	in COMBO-17 footprint, but not detected by COMBO-17 (only in STAGES)	23833
	2	detected by COMBO-17, but neither galaxy, nor cluster, nor WGM05	48860
	3	galaxy† but neither cluster, nor WGM05	12625
	4	cluster‡ galaxy, but not WGM05	1504
	5	cluster galaxy in WGM05*	786
`MIPS_FLAG`	0	detected only by STAGES	25104
	1	detected by COMBO-17*, but outside MIPS footprint	11858
	2	detected by COMBO-17 and inside MIPS footprint, but not detected by MIPS	48885
	3	detected by COMBO-17 and detected by MIPS	3032

† master 'galaxy' selection (`COMBO_FLAG` ≥ 3) is defined as:
`MC_CLASS="Gal*" && PHOT_FLAG<8 && ap_Rmag<24`

‡ master 'cluster' selection (`COMBO_FLAG` ≥ 4) constructed for 90% completeness as follows:
`COMBO_FLAG=3 && (abs(MC_Z-0.17)<dz)`, where
$dz = \sqrt{0.015^2 + (1.65\sigma(R))^2}$, and
$\sigma(R) = 1.17 * 0.005\sqrt{1 + 10^{0.6(\texttt{Rmag}-20.5)}}$

* 'WGM05' are those objects used in Wolf et al (2005), but now missing 9 objects which are now removed by subsequent updating of the COMBO-17 `PHOT_FLAG` column.

* the MIPS 24μm catalogue was matched only to COMBO-17 and not to STAGES

2.1 A few examples of how to select some useful samples:

	Sample	Selection (Boolean AND)	N
1	STAGES galaxies (extended) w/ COMBO-17 info	COMBO_FLAG ≥ 3 STAGES_FLAG ≥ 3	12574
2	STAGES galaxies (extended) w/ COMBO-17 info AND redshifts	COMBO_FLAG ≥ 3 STAGES_FLAG ≥ 3 MC_z != NaN	11298
3	STAGES galaxies w/ good GALFIT AND w/ COMBO-17 info	COMBO_FLAG ≥ 3 STAGES_FLAG ≥ 4	11508
4	STAGES galaxies w/ COMBO-17 "QSO" or "QSO (Gal?)" class designation	STAGES_FLAG ≥ 3 MC_class = "*QSO*"	84
5	COMBO-17 stars unresolved in STAGES	STAGES_FLAG $= 2$ MC_class = "Star"	2099
6	cluster galaxies and extended HST source	COMBO_FLAG ≥ 4 STAGES_FLAG ≥ 3	1990
7	WGM05 cluster galaxies	COMBO_FLAG $= 5$	786
8	WGM05 cluster galaxies and extended HST source	COMBO_FLAG $= 5$ STAGES_FLAG ≥ 3	755
9	cluster galaxies with SFR (IR) from MIPS and HST extended	COMBO_FLAG ≥ 4 STAGES_FLAG ≥ 3 MIPS_FLAG $= 3$	236

Note, blank column entries have special values depending on the variable type:

- int / long variables have an "undefined" value of -32768 / -2147483648 (ST_NUMBER, ST_FLAGS, ST_TILE, COMBO_NR, MC_AGE_ML, PHOT_FLAG, COMBO_FLAG, STAGES_FLAG, MIPS_FLAG, SED_TYPE).
- float variables have -NaN

Users should be aware how their choice of FITS reading software treats NaN values, as this varies (e.g. IDL users should utilize the FINITE function). Not trapping these values might result in certain commands producing unwanted results.

3 Some illustrative figures of various sample selections

Here we offer some examples using various sample selections, designed to highlight the varying regions of overlap between the COMBO-17, STAGES HST and Spitzer observations.

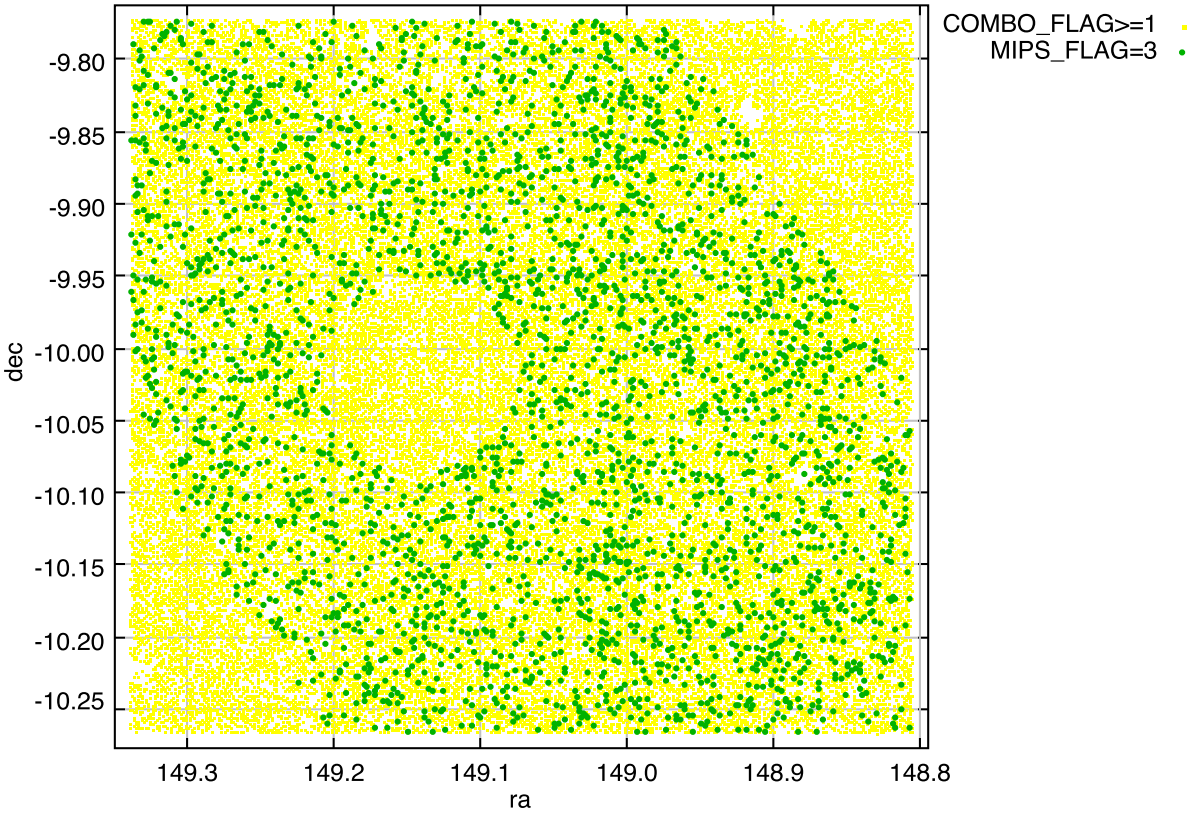

Figure 1: Comparing COMBO-17 and MIPS detections using COMBO-17 positions (columns `RA, DEC`). `MIPS_FLAG`=3 objects (detected by COMBO-17 and detected by MIPS; green) are shown relative to all COMBO-17 objects (`COMBO_FLAG`$\geq$1; yellow) in the background. Note the large area in the centre excluded from the MIPS catalogue due to a bright star.

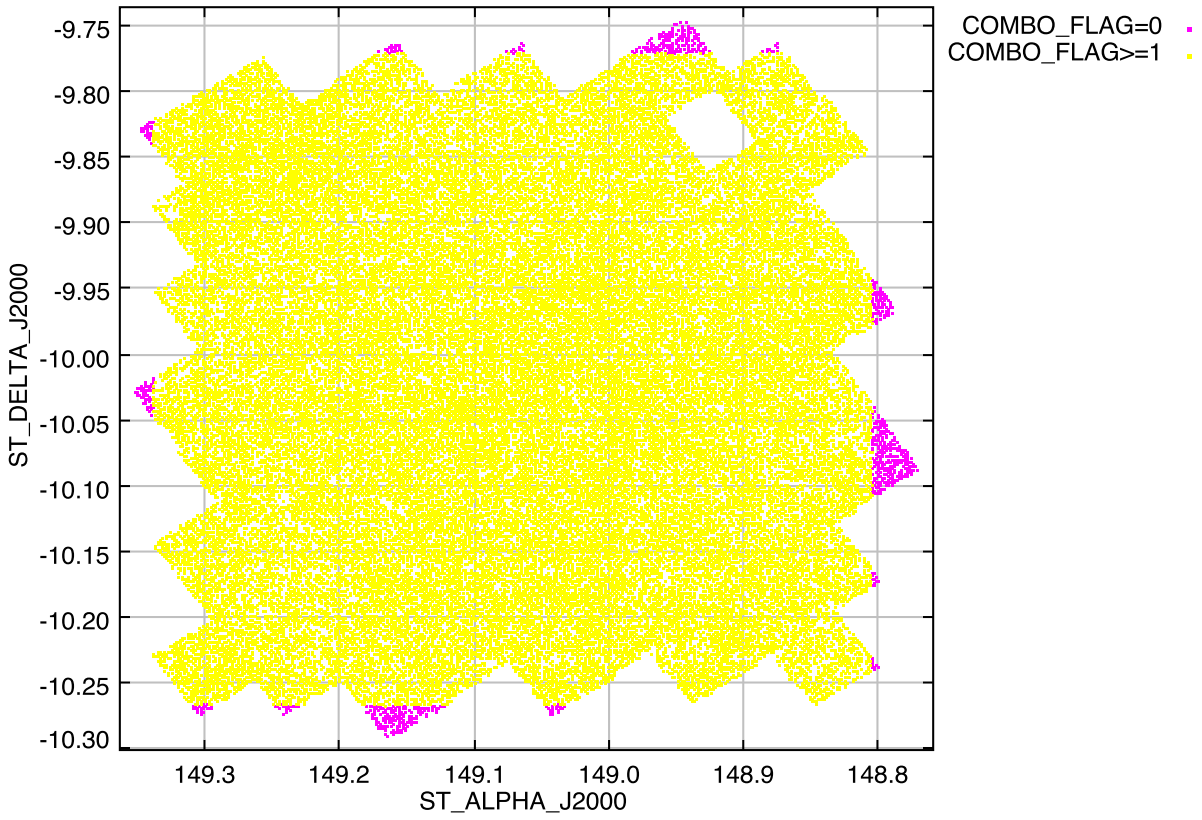

Figure 2: Comparing STAGES/COMBO-17 subsamples using STAGES coordinates (`ST_ALPHA_J2000`, `ST_DELTA_J2000`). `COMBO_FLAG`=0 objects (magenta) are STAGES objects that have no COMBO-17 information, while `COMBO_FLAG`$\geq$1 objects (yellow) do.

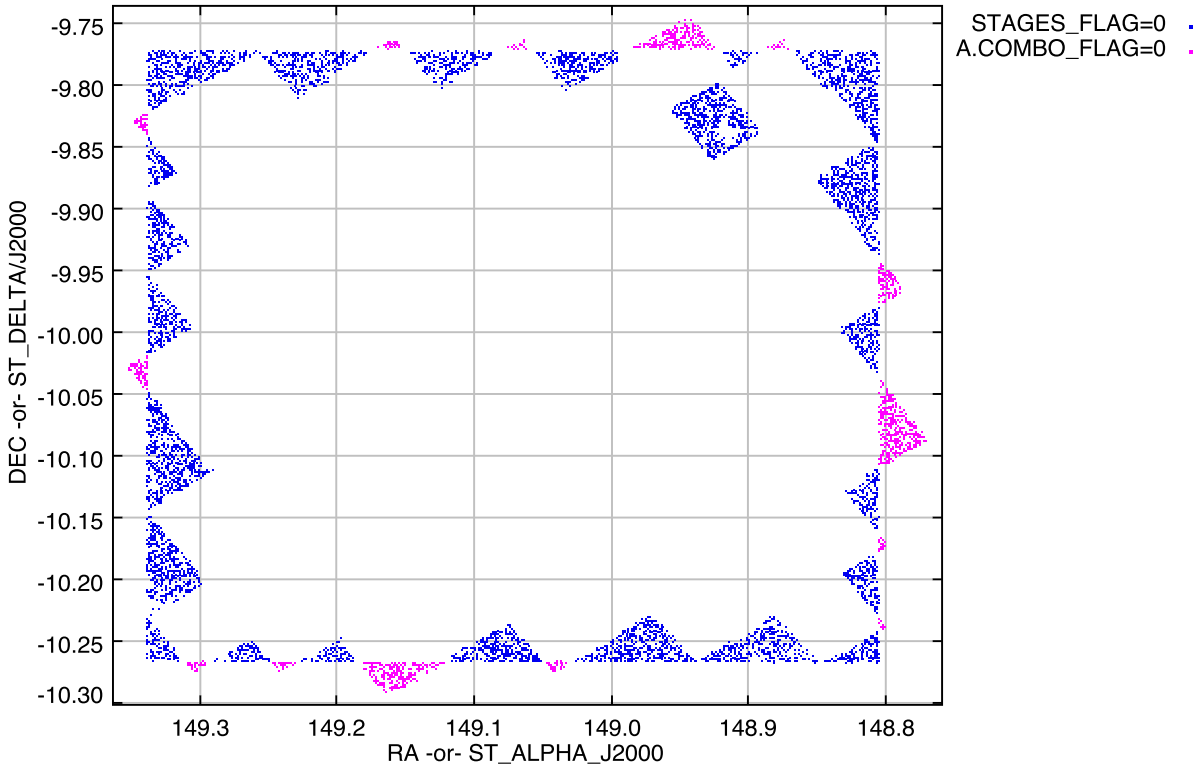

Figure 3: Comparing STAGES/COMBO-17 subsamples. `COMBO_FLAG`=0 objects (magenta) are STAGES objects that have no COMBO-17 information (using STAGES coordinates `ST_ALPHA_J2000, ST_DELTA_J2000`), while `STAGES_FLAG`=0 objects (blue) are COMBO-17 objects with no STAGES information (using COMBO-17 coordinates `RA, DEC`).

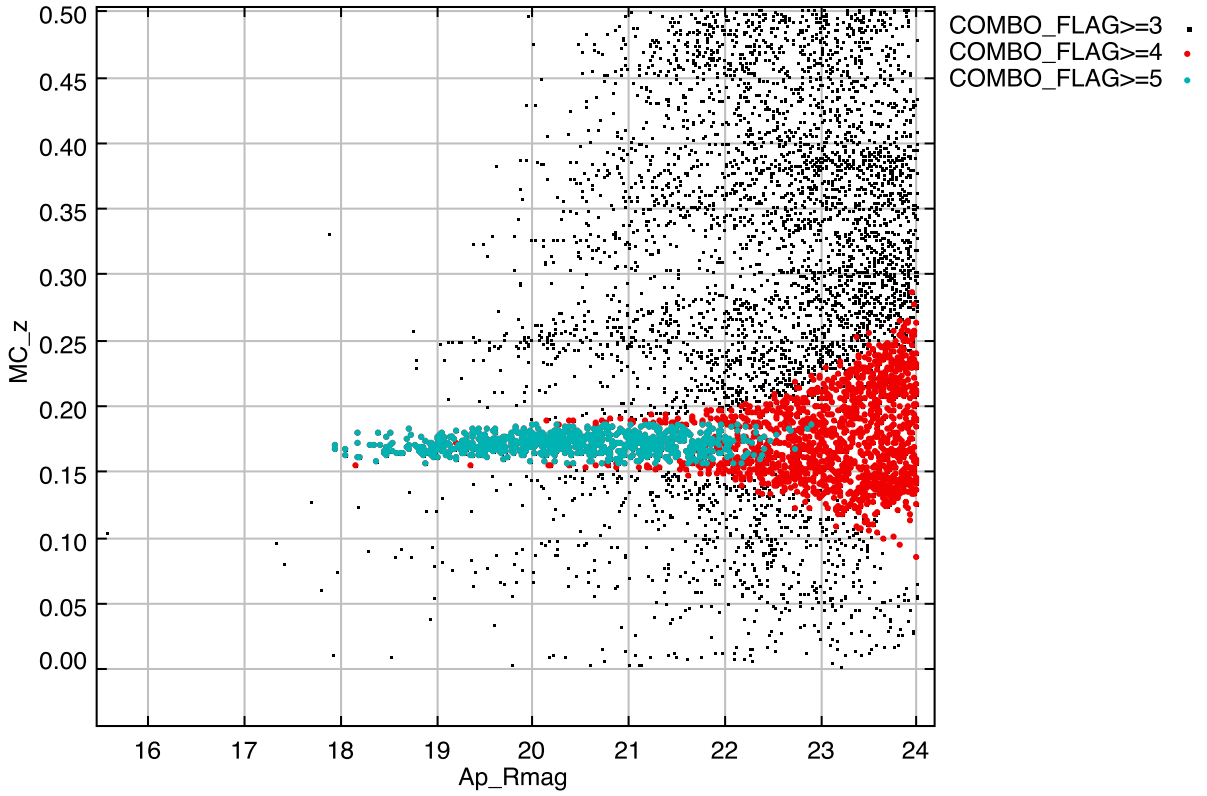

Figure 4: Selecting 'galaxy' (`COMBO_FLAG`$\geq$ 3; black), 'cluster' (`COMBO_FLAG`$\geq$ 4; red), and 'WGM05' (`COMBO_FLAG`$\geq$ 5; cyan) samples by photometry alone. The plot shows COMBO-17 photometric redshift vs COMBO-17 R-band aperture magnitude.