

```
In [ ]: import time
import numpy as np
from load_supermock_lite import load_single_skypatch, combine_multiple_skypatches
from plot_utils import calculate_and_plot_hmf, calculate_and_plot_dN_dz, base_m
# import plot_utils
# import importlib
# importlib.reload(plot_utils)
```

SuperMockLite:

- This is an intermediate dataproduct
- In this dataset, the full sky is divided to 192 patches.
- Each skypatch is in separate files and can be loaded individually or together (loaders provided).
- This is a core catalog in the sky. There are no stellar masses, star formation histories, SEDs, photometries.
- Useful if you want to apply simple HODs, paint.
- Full catalog (with SFHs, SEDs etc is roughly 200x bigger in storage is being generated
- This catalog consists of over 6.9 billion cores: consisting of centrals, satellites and merged cores.

Loading single skypatch. The skypatch ID can be: 1-191

```
In [ ]: time1 = time.time()
target_skypatch_id = 130
output_file = f"finished_mocks/supermock_lite_lightcone_skypatch_{target_skypatch_id}.h5"
# Load matches_for_lc from the HDF5 file
core_catalog = load_single_skypatch(output_file)
print('Available match keys: ', core_catalog.keys())
print('Matches: ', core_catalog['x'].shape, 'Skypatch: ', target_skypatch_id)
time2 = time.time()
print(f'Time taken %.2f minutes'%((time2 - time1)/60))
```

Available match keys: dict_keys(['central', 'core_state', 'core_tag', 'dec', 'merged', 'ra', 'redshift', 'tree_node_mass', 'x', 'y', 'z'])
Matches: (36183807,) Skypatch: 130
Time taken 0.26 minutes

Loading multiple skypatches. You may choose to load all or part, based on file patterns.

```
In [ ]: # Define the glob pattern to match your HDF5 files
# Adjust the path and pattern as needed
file_pattern = "finished_mocks/supermock_lite_lightcone_skypatch_*.h5"

time1 = time.time()

# Call the function to combine skypatch catalogs
try:
    core_catalog = combine_multiple_skypatches(file_pattern)
```

```
except FileNotFoundError as fnf_error:
    print(fnf_error)
except ValueError as val_error:
    print(val_error)

time2 = time.time()
print(f'Time taken %.2f minutes'%((time2 - time1)/60))
```

Found 191 files matching pattern 'finished_mock/supermock_lite_lightcone_skypatch_*.h5'.

Loading file 1/191: supermock_lite_lightcone_skypatch_1.h5

Expected 'tree_node_mass' ndim set to 1 based on 'supermock_lite_lightcone_skypatch_1.h5'.

Loading file 2/191: supermock_lite_lightcone_skypatch_10.h5

Loading file 3/191: supermock_lite_lightcone_skypatch_100.h5

Loading file 4/191: supermock_lite_lightcone_skypatch_101.h5

Loading file 5/191: supermock_lite_lightcone_skypatch_102.h5

Loading file 6/191: supermock_lite_lightcone_skypatch_103.h5

Loading file 7/191: supermock_lite_lightcone_skypatch_104.h5

Loading file 8/191: supermock_lite_lightcone_skypatch_105.h5

Loading file 9/191: supermock_lite_lightcone_skypatch_106.h5

Loading file 10/191: supermock_lite_lightcone_skypatch_107.h5

Loading file 11/191: supermock_lite_lightcone_skypatch_108.h5

Loading file 12/191: supermock_lite_lightcone_skypatch_109.h5

Loading file 13/191: supermock_lite_lightcone_skypatch_11.h5

Loading file 14/191: supermock_lite_lightcone_skypatch_110.h5

Loading file 15/191: supermock_lite_lightcone_skypatch_111.h5

Loading file 16/191: supermock_lite_lightcone_skypatch_112.h5

Loading file 17/191: supermock_lite_lightcone_skypatch_113.h5

Loading file 18/191: supermock_lite_lightcone_skypatch_114.h5

Loading file 19/191: supermock_lite_lightcone_skypatch_115.h5

Loading file 20/191: supermock_lite_lightcone_skypatch_116.h5

Loading file 21/191: supermock_lite_lightcone_skypatch_117.h5

Loading file 22/191: supermock_lite_lightcone_skypatch_118.h5

Loading file 23/191: supermock_lite_lightcone_skypatch_119.h5

Loading file 24/191: supermock_lite_lightcone_skypatch_12.h5

Loading file 25/191: supermock_lite_lightcone_skypatch_120.h5

Loading file 26/191: supermock_lite_lightcone_skypatch_121.h5

Loading file 27/191: supermock_lite_lightcone_skypatch_122.h5

Loading file 28/191: supermock_lite_lightcone_skypatch_123.h5

Loading file 29/191: supermock_lite_lightcone_skypatch_124.h5

Loading file 30/191: supermock_lite_lightcone_skypatch_125.h5

Loading file 31/191: supermock_lite_lightcone_skypatch_126.h5

Loading file 32/191: supermock_lite_lightcone_skypatch_127.h5

Loading file 33/191: supermock_lite_lightcone_skypatch_128.h5

Loading file 34/191: supermock_lite_lightcone_skypatch_129.h5

Loading file 35/191: supermock_lite_lightcone_skypatch_13.h5

Loading file 36/191: supermock_lite_lightcone_skypatch_130.h5

Loading file 37/191: supermock_lite_lightcone_skypatch_131.h5

Loading file 38/191: supermock_lite_lightcone_skypatch_132.h5

Loading file 39/191: supermock_lite_lightcone_skypatch_133.h5

Loading file 40/191: supermock_lite_lightcone_skypatch_134.h5

Loading file 41/191: supermock_lite_lightcone_skypatch_135.h5

Loading file 42/191: supermock_lite_lightcone_skypatch_136.h5

Loading file 43/191: supermock_lite_lightcone_skypatch_137.h5

Loading file 44/191: supermock_lite_lightcone_skypatch_138.h5

Loading file 45/191: supermock_lite_lightcone_skypatch_139.h5

Loading file 46/191: supermock_lite_lightcone_skypatch_14.h5

Loading file 47/191: supermock_lite_lightcone_skypatch_140.h5

Loading file 48/191: supermock_lite_lightcone_skypatch_141.h5

Loading file 49/191: supermock_lite_lightcone_skypatch_142.h5

Loading file 50/191: supermock_lite_lightcone_skypatch_143.h5

Loading file 51/191: supermock_lite_lightcone_skypatch_144.h5

Loading file 52/191: supermock_lite_lightcone_skypatch_145.h5

Loading file 53/191: supermock_lite_lightcone_skypatch_146.h5

Loading file 54/191: supermock_lite_lightcone_skypatch_147.h5

Loading file 55/191: supermock_lite_lightcone_skypatch_148.h5

Loading file 56/191: supermock_lite_lightcone_skypatch_149.h5

[illegible]

[illegible]

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Loading file 177/191: supermock_lite_lightcone_skypatch_86.h5
Loading file 178/191: supermock_lite_lightcone_skypatch_87.h5
Loading file 179/191: supermock_lite_lightcone_skypatch_88.h5
Loading file 180/191: supermock_lite_lightcone_skypatch_89.h5
Loading file 181/191: supermock_lite_lightcone_skypatch_9.h5
Loading file 182/191: supermock_lite_lightcone_skypatch_90.h5
Loading file 183/191: supermock_lite_lightcone_skypatch_91.h5
Loading file 184/191: supermock_lite_lightcone_skypatch_92.h5
Loading file 185/191: supermock_lite_lightcone_skypatch_93.h5
Loading file 186/191: supermock_lite_lightcone_skypatch_94.h5
Loading file 187/191: supermock_lite_lightcone_skypatch_95.h5
Loading file 188/191: supermock_lite_lightcone_skypatch_96.h5
Loading file 189/191: supermock_lite_lightcone_skypatch_97.h5
Loading file 190/191: supermock_lite_lightcone_skypatch_98.h5
Loading file 191/191: supermock_lite_lightcone_skypatch_99.h5
Combined key 'central' with shape (6909468978,).
Combined key 'core_state' with shape (6909468978,).
Combined key 'core_tag' with shape (6909468978,).
Combined key 'dec' with shape (6909468978,).
Combined key 'merged' with shape (6909468978,).
Combined key 'ra' with shape (6909468978,).
Combined key 'redshift' with shape (6909468978,).
Combined key 'tree_node_mass' with shape (6909468978,).
Combined key 'x' with shape (6909468978,).
Combined key 'y' with shape (6909468978,).
Combined key 'z' with shape (6909468978,).
All catalogs have been successfully combined.
Time taken 56.76 minutes

```

Central, satellite and merged cores: Use the selection tags below to choose the type of core/galaxies

```

In [ ]: central_cond = (core_catalog['central'] == 1)
satellite_cond = (core_catalog['central'] == 0) & (core_catalog['merged'] == 0)
merged_cond = (core_catalog['central'] == 0) & (core_catalog['merged'] == 1)

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In [ ]: central_halo_mass = core_catalog['tree_node_mass'][central_cond]
satellite_halo_mass = core_catalog['tree_node_mass'][satellite_cond]

## Remove -1
central_halo_mass = central_halo_mass[central_halo_mass != -1]
satellite_halo_mass = satellite_halo_mass[satellite_halo_mass != -1]

redshift_central = core_catalog['redshift'][central_cond]
redshift_satellite = core_catalog['redshift'][satellite_cond]

redshift_central = redshift_central[redshift_central != -1]
redshift_satellite = redshift_satellite[redshift_satellite != -1]

```

```

In [ ]: ra_central = core_catalog['ra'][central_cond]
ra_satellite = core_catalog['ra'][satellite_cond]

ra_central = ra_central[ra_central != -1]
ra_satellite = ra_satellite[ra_satellite != -1]

dec_central = core_catalog['dec'][central_cond]
dec_satellite = core_catalog['dec'][satellite_cond]

```

```
dec_central = dec_central[dec_central != -1]
dec_satellite = dec_satellite[dec_satellite != -1]
```

Sample plotting routines: Halo mass function --- all routines are trials only.

```
In [ ]: num_bins = 40 #np.linspace( 10.5, 16, 100)

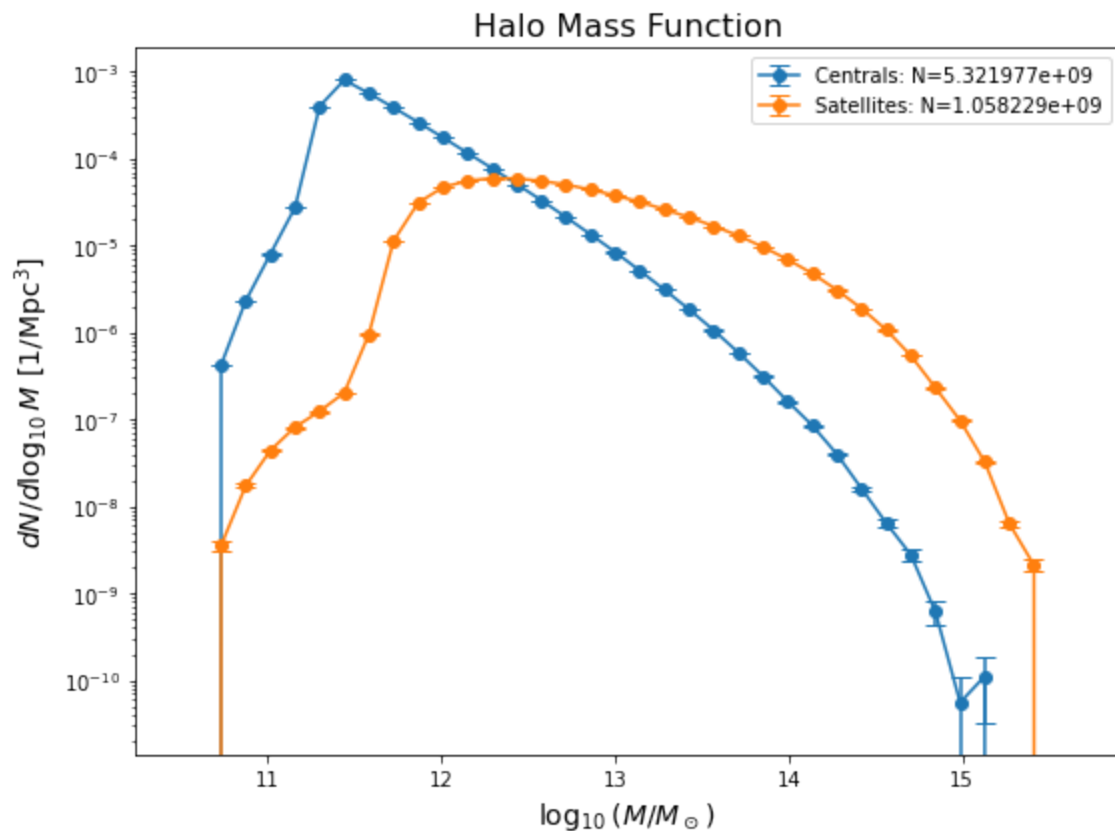
n_cen = int(central_halo_mass.shape[0]*0.01)
n_sat = int(satellite_halo_mass.shape[0]*0.01)

random_cen_indices = np.random.randint(low=0, high=central_halo_mass.shape[0],
random_sat_indices = np.random.randint(low=0, high=satellite_halo_mass.shape[0],

mass_arrays = [central_halo_mass[random_cen_indices], satellite_halo_mass[random_sat_indices]]
labels = ['Centrals: N=%e'%central_halo_mass.shape[0], 'Satellites: N=%e'%satellite_halo_mass.shape[0]]

# Define the survey or simulation volume in Mpc^3
L = 5025 # Mpc
volume = L**3 # Mpc^3

# Call the function to calculate and plot the HMF
calculate_and_plot_hmf(mass_arrays, labels, volume, num_bins=num_bins)
```

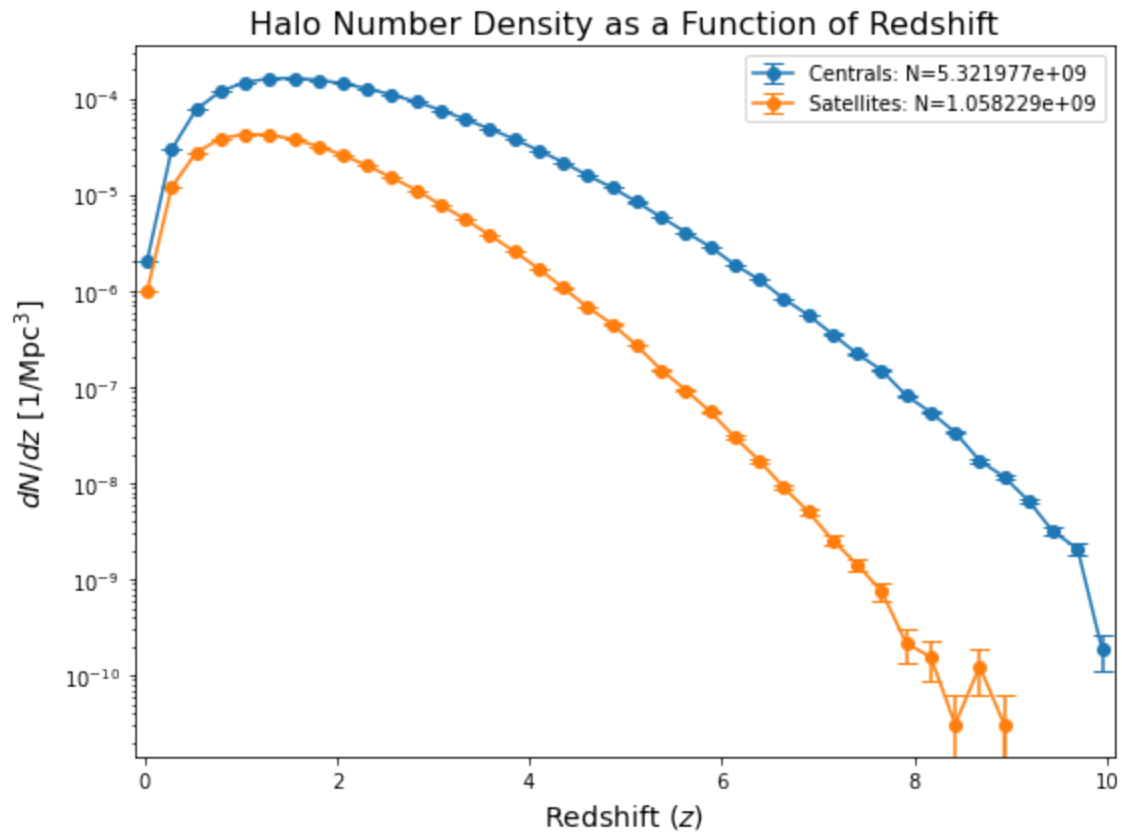


Sample plotting routines: Redshift distribution

```
In [ ]: num_bins = 40
mass_arrays = [redshift_central[random_cen_indices], redshift_satellite[random_sat_indices]]
labels = ['Centrals: N=%e'%central_halo_mass.shape[0], 'Satellites: N=%e'%satellite_halo_mass.shape[0]]
```

```
# Define the survey or simulation volume in Mpc^3
L = 5025 # Mpc
volume = L**3 # Mpc^3

# Call the function to calculate and plot the HMF
calculate_and_plot_dN_dz(mass_arrays, labels, volume, num_bins=num_bins)
```



Sample plotting routines: Sky coverage

```
In [ ]: basemap_plot(ra_central, dec_central, 'w')
```

Sky Distribution of Galaxies in full sky

