In [39]:

```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
from tqdm import tqdm

import warnings
warnings.filterwarnings("ignore")

from multiprocessing import cpu_count, Pool
```

executed in 157ms, finished 22:35:09 2018-10-29

In [2]:

```
tr = pd.read_pickle('../data/train.pkl')
tr_log = pd.read_pickle('../data/train_log.pkl')
```

executed in 549ms, finished 21:32:07 2018-10-29

In [3]:

```
tr.head()
```

executed in 22ms, finished 21:32:07 2018-10-29

Out[3]:

	object_id	ra	decl	gal_l	gal_b	ddf	hostgal_specz	ho
0	615	349.046051	-61.943836	320.796530	-51.753706	1	0.0000	
1	713	53.085938	-27.784405	223.525509	-54.460748	1	1.8181	
2	730	33.574219	-6.579593	170.455585	-61.548219	1	0.2320	
3	745	0.189873	-45.586655	328.254458	-68.969298	1	0.3037	
4	1124	352.711273	-63.823658	316.922299	-51.059403	1	0.1934	

In [4]:

```
tr.tail()
```

executed in 22ms, finished 21:32:07 2018-10-29

Out[4]:

	object_id	ra	decl	gal_l	gal_b	ddf	hostgal_specz
7843	130739978	26.718750	-14.940303	172.342697	-72.255675	0	0.0000
7844	130755807	120.101349	-62.696659	275.742955	-16.509746	0	0.1725
7845	130762946	203.108109	-55.682144	308.728904	6.727511	0	0.0000
7846	130772921	79.101562	-35.501846	239.172243	-33.827844	0	0.0000
7847	130779836	301.992188	-17.426323	25.102988	-24.511101	0	0.0000

In [5]:

```
tr_log.head(20)
```

executed in 14ms, finished 21:32:07 2018-10-29

Out[5]:

	object_id	mjd	passband	flux	flux_err	detected
0	615	59750.421875	2	-544.810303	3.622952	1
1	615	59750.429688	1	-816.434326	5.553370	1
2	615	59750.437500	3	-471.385529	3.801213	1
3	615	59750.445312	4	-388.984985	11.395031	1
4	615	59752.406250	2	-681.858887	4.041204	1
5	615	59752.414062	1	-1061.457031	6.472994	1
6	615	59752.421875	3	-524.954590	3.552751	1
7	615	59752.433594	4	-393.480225	3.599346	1
8	615	59752.445312	5	-355.886780	10.421921	1
9	615	59767.296875	2	-548.013550	3.462291	1
10	615	59767.304688	1	-815.188599	5.293019	1
11	615	59767.312500	3	-475.516052	3.340643	1
12	615	59767.324219	4	-405.663818	3.496113	1
13	615	59767.335938	5	-421.199066	6.377517	1
14	615	59770.218750	2	-554.903198	3.927843	1
15	615	59770.226562	1	-820.042786	5.875329	1
16	615	59770.234375	3	-477.004730	3.736262	1
17	615	59770.246094	4	-400.270386	3.834955	1
18	615	59770.253906	5	-415.286896	7.435979	1
19	615	59779.320312	2	-630.523682	4.333287	1

In [6]:

```
df = tr_log[tr_log.object_id==615]
```

executed in 15ms, finished 21:32:08 2018-10-29

In [7]:

```
df['date'] = df.mjd.astype(int)
```

executed in 67ms, finished 21:32:08 2018-10-29

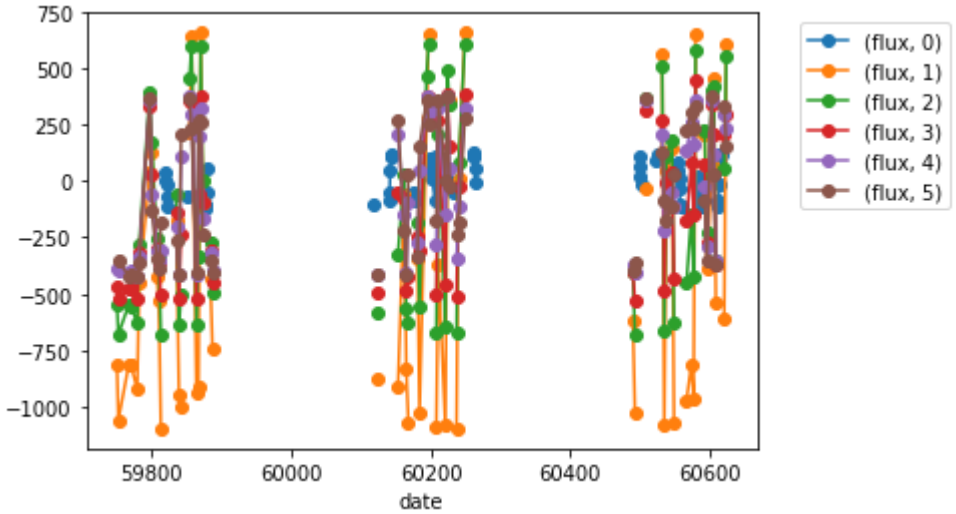
In [8]:

```
pd.pivot_table(df, index=['date'], columns=['passband'], values=['flux']).plot(marker="o",
plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
```

executed in 706ms, finished 21:32:09 2018-10-29

Out[8]:

<matplotlib.legend.Legend at 0x7feb6fdcb860>



In [9]:

```
pd.pivot_table(df, index=['date'], columns=['passband'], values=['flux']).reset_index().hea
```

executed in 29ms, finished 21:32:09 2018-10-29

Out[9]:

	date	flux					
passband		0	1	2	3	4	5
0	59750	NaN	-816.434326	-544.810303	-471.385529	-388.984985	
1	59752	NaN	-1061.457031	-681.858887	-524.954590	-393.480225	-355.88
2	59767	NaN	-815.188599	-548.013550	-475.516052	-405.663818	-421.19
3	59770	NaN	-820.042786	-554.903198	-477.004730	-400.270386	-415.28
4	59779	NaN	-921.002502	-630.523682	-518.533997	-422.184509	-422.81

In [25]:

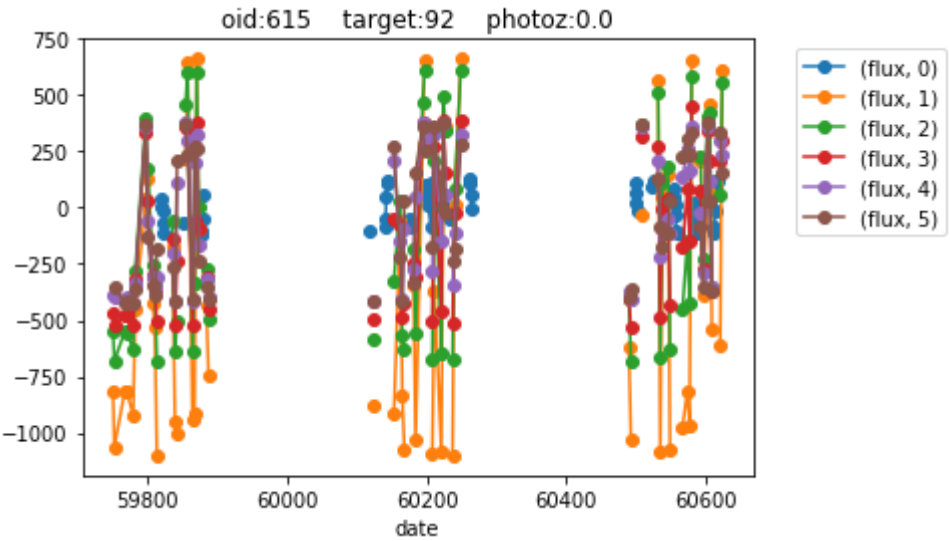
```
def plt_obj(oid=None, save=False, path=None, norm=False, return_df=False):
    if oid is None:
        oid = np.random.choice(tr.object_id)
    df = tr_log[tr_log.object_id==oid]
    if norm:
        df.flux /= df.flux.max()
    target = tr.loc[tr.object_id==oid, 'target'].values[0]
    photoz = tr.loc[tr.object_id==oid, 'hostgal_photoz'].values[0]

    df['date'] = df.mjd.astype(int)

    df = pd.pivot_table(df, index=['date'], columns=['passband'], values=['flux'])
    if return_df:
        return df

    df.plot(marker="o", legend=True)
    plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
    plt.title(f'oid:{oid}    target:{target}    photoz:{photoz}')
    if save==True and path is not None:
        plt.savefig(path)
    return
```

executed in 29ms, finished 22:16:37 2018-10-29

In [11]:

```
plt_obj(615)
```

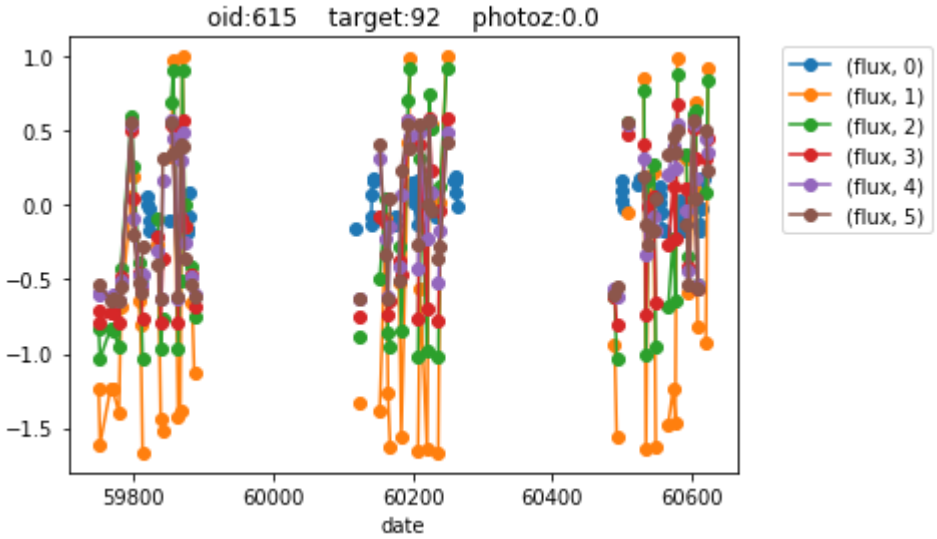
executed in 268ms, finished 21:32:12 2018-10-29



In [18]:

```
plt_obj(615, norm=True)
```

executed in 2.76s, finished 21:38:45 2018-10-29



In [19]:

```
classes = [6, 15, 16, 42, 52, 53, 62, 64, 65, 67, 88, 90, 92, 95]
li = []
for c in classes:
    li += tr[tr.target==c].sample(25).object_id.tolist()
```

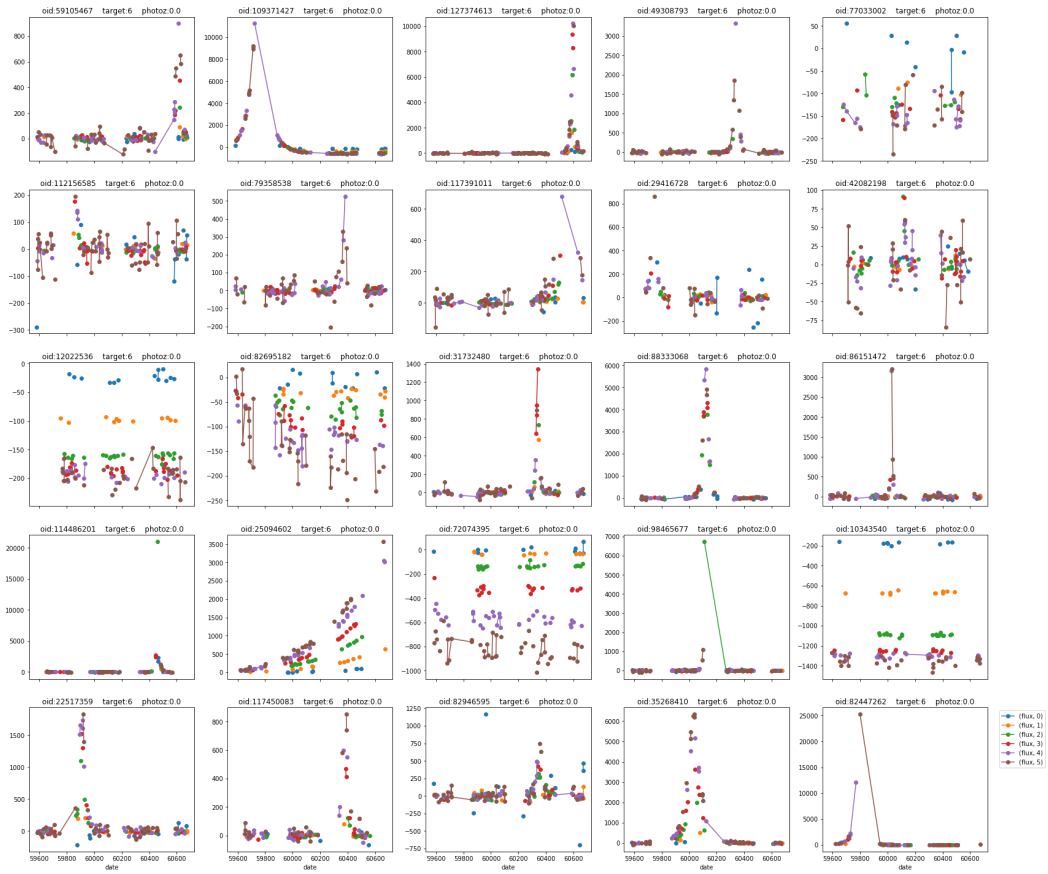
executed in 22ms, finished 22:00:30 2018-10-29

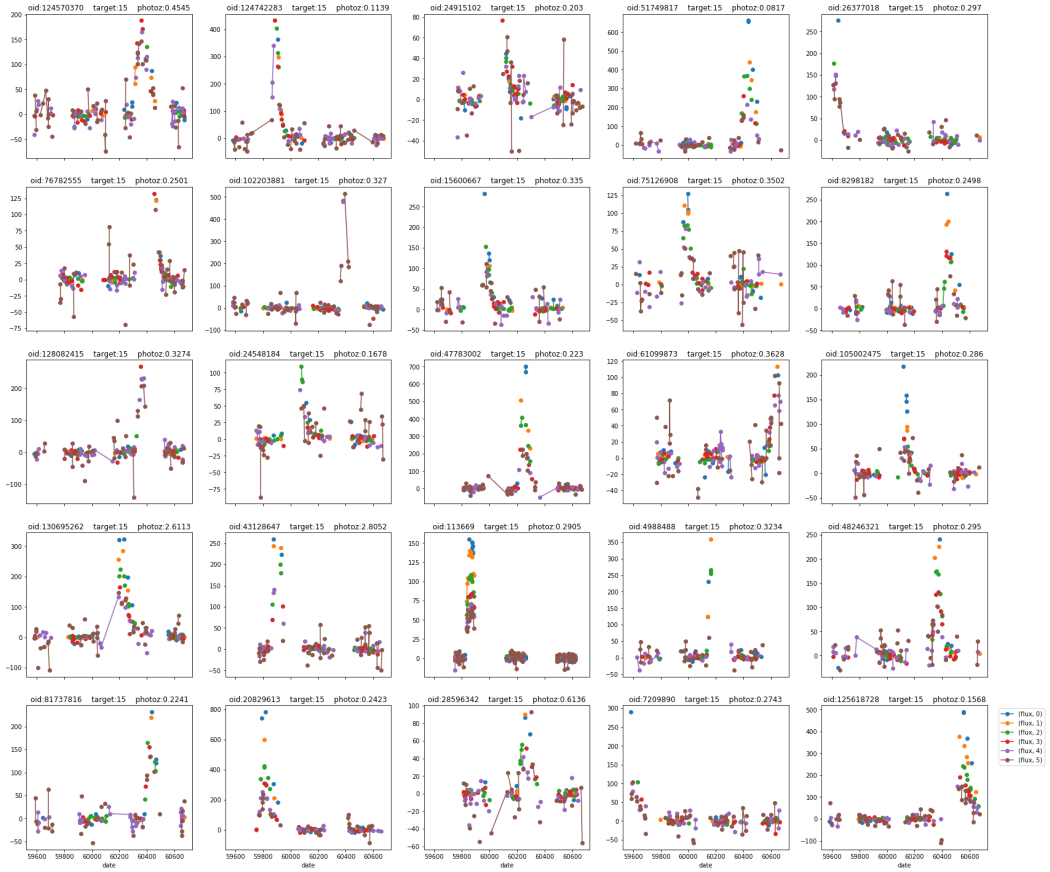
In [40]:

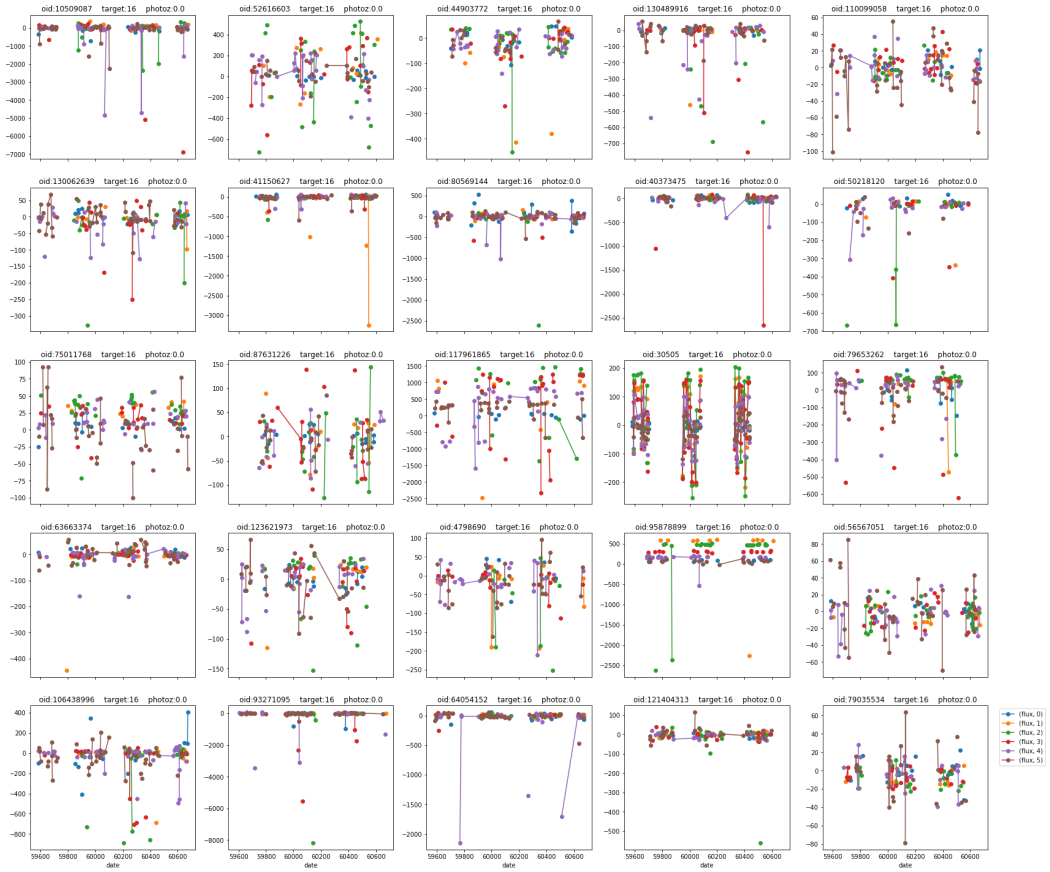
```
classes = [6, 15, 16, 42, 52, 53, 62, 64, 65, 67, 88, 90, 92, 95]

for c in tqdm(classes):
    li = tr[tr.target==c].sample(25).object_id.tolist()
    fig, axes = plt.subplots(ncols=5, nrows=5, figsize=(28, 25), sharex=True)

    # プロット
    for i,(ax, oid) in enumerate(zip(axes.ravel(), li)):
        df=plt_obj(oid, return_df=True)

        target = tr.loc[tr.object_id==oid, 'target'].values[0]
        photoz = tr.loc[tr.object_id==oid, 'hostgal_photoz'].values[0]

        if i==24:
            legend=True
        else:
            legend = False
        df.plot(ax=ax,  marker="o", legend=legend, title=f'oid:{oid}    target:{target}    photoz:

    plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
```

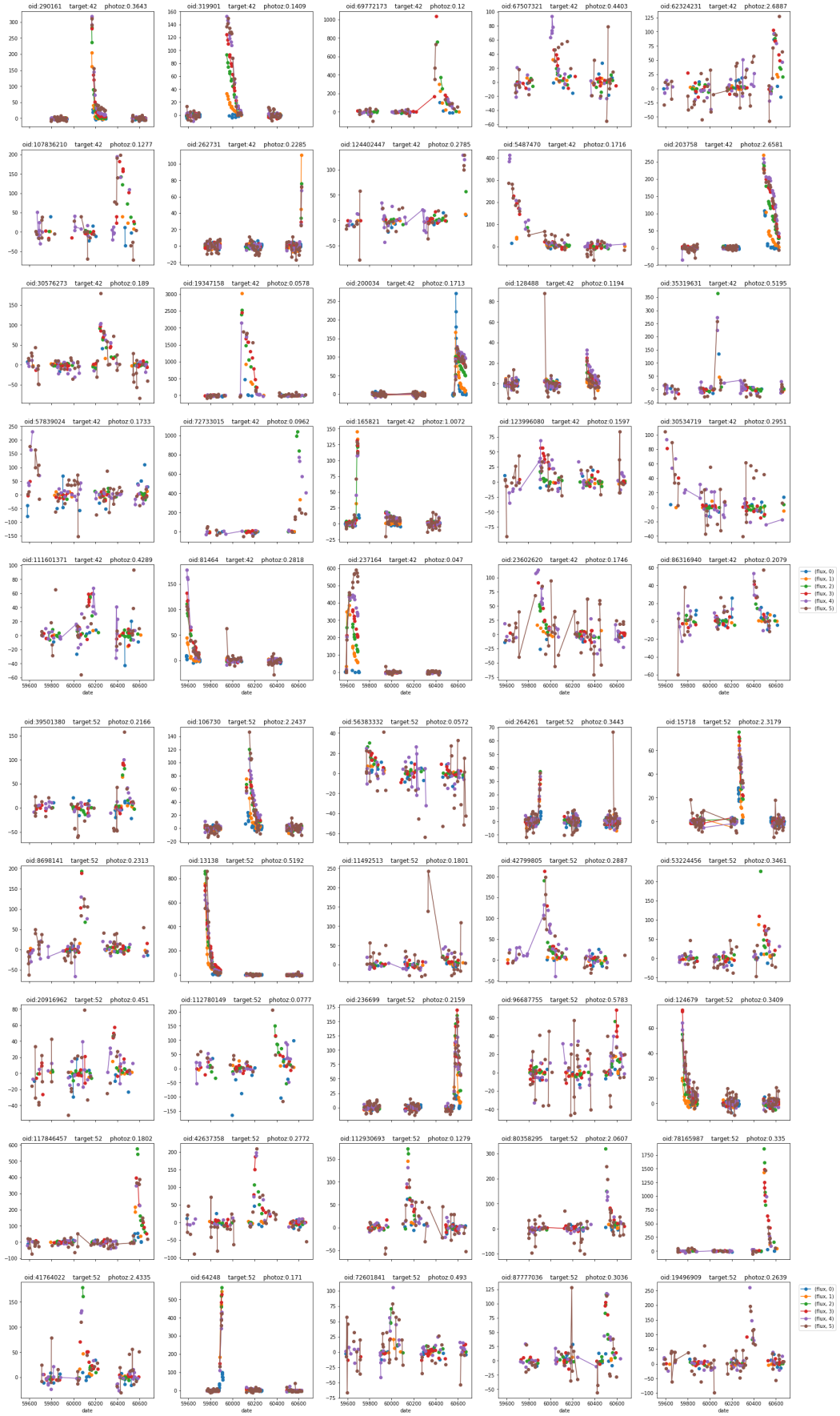
executed in 5m 48s, finished 22:41:06 2018-10-29

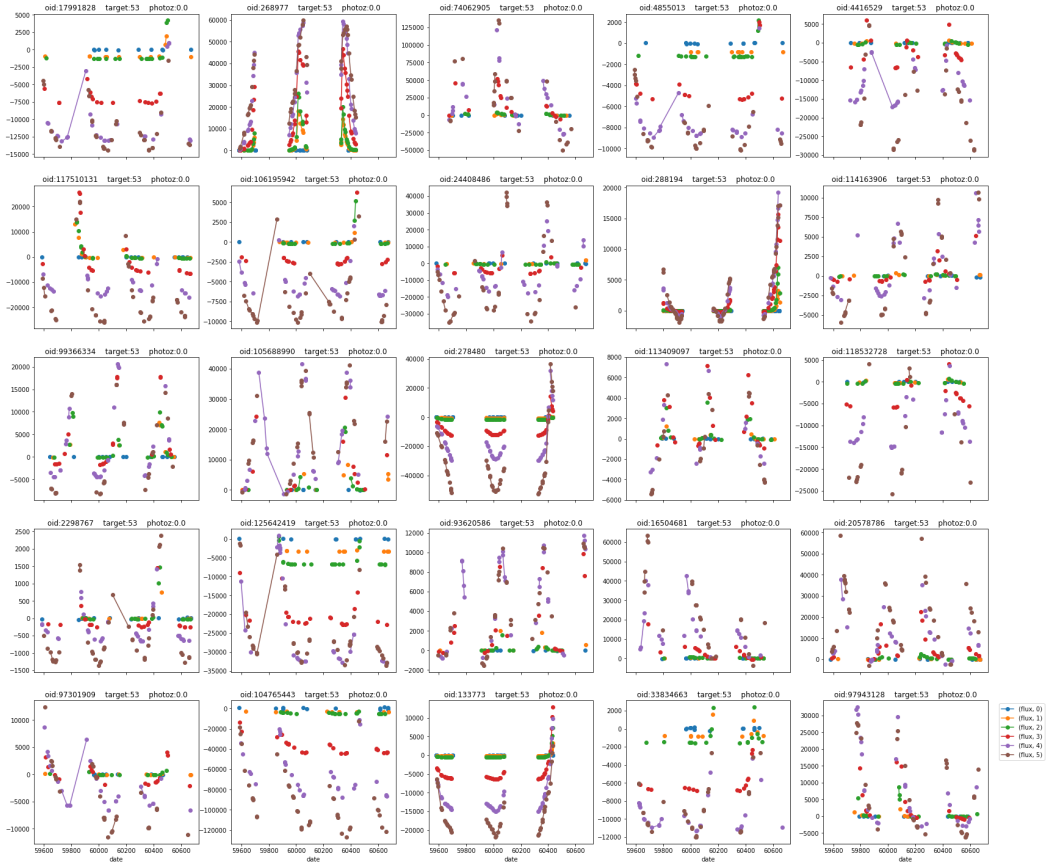
100%|████████████████████| 14/14 [05:20<00:00, 22.92s/it]

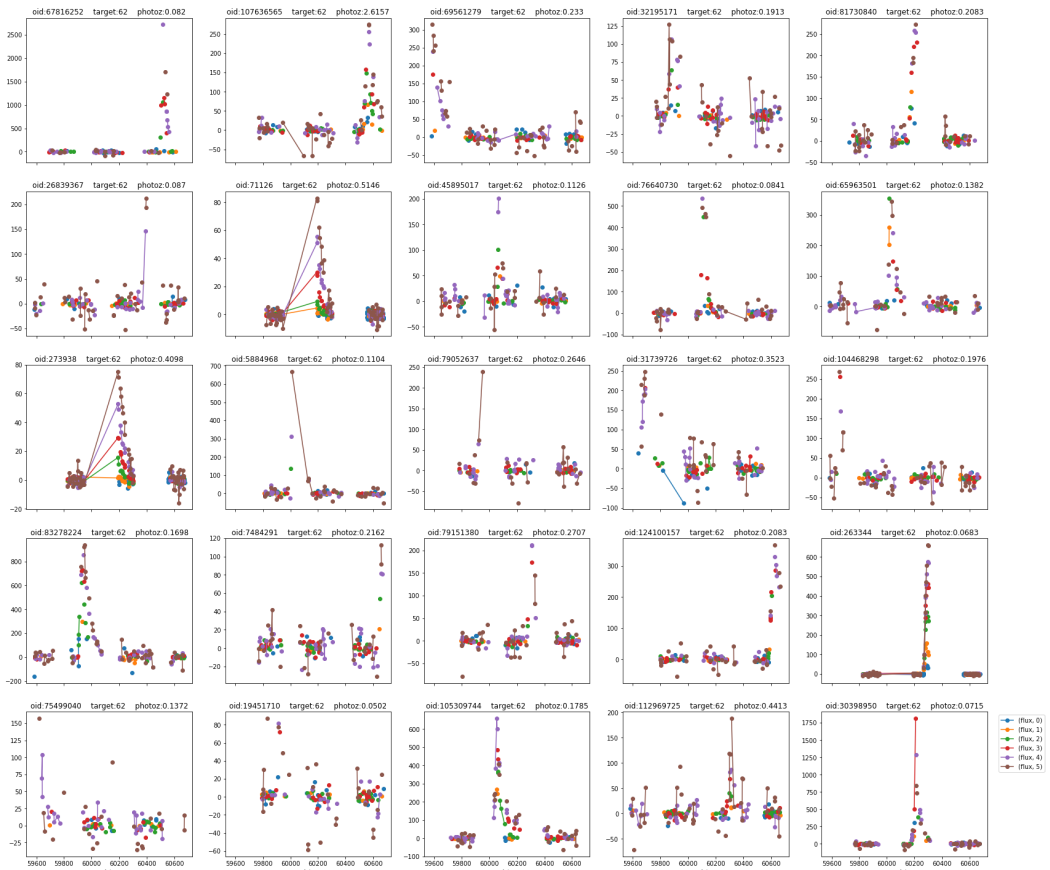


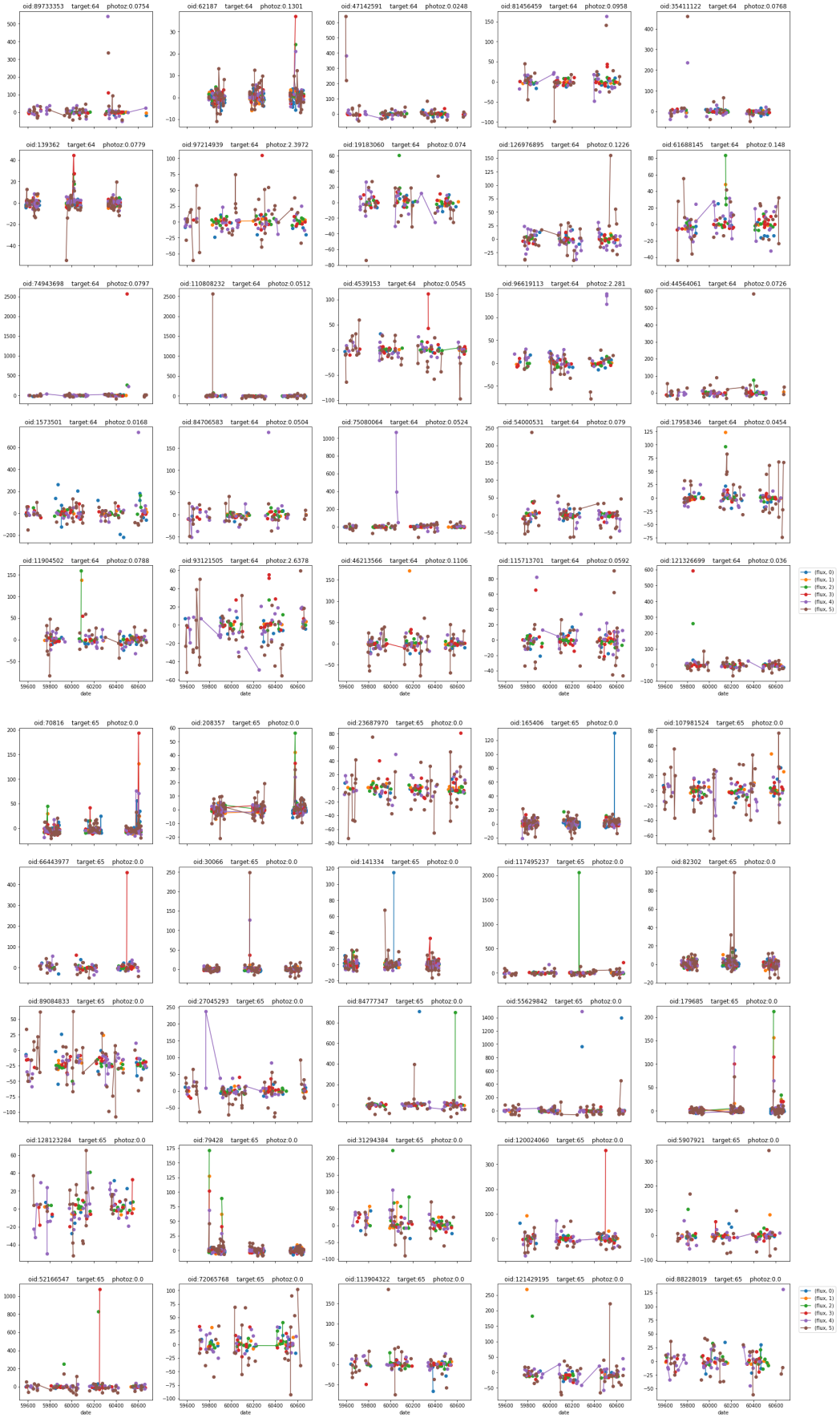

oid:124570370 target:15 photoz:0.4545
oid:124742283 target:15 photoz:0.1139
oid:24915102 target:15 photoz:0.203
oid:51749817 target:15 photoz:0.0817
oid:26377018 target:15 photoz:0.297
oid:76782555 target:15 photoz:0.2501
oid:102203881 target:15 photoz:0.327
oid:15600667 target:15 photoz:0.335
oid:75126908 target:15 photoz:0.3502
oid:8298182 target:15 photoz:0.2498
oid:128082415 target:15 photoz:0.3274
oid:24548184 target:15 photoz:0.1678
oid:47783002 target:15 photoz:0.223
oid:61099873 target:15 photoz:0.3628
oid:105002475 target:15 photoz:0.286
oid:130695262 target:15 photoz:2.6113
oid:43128647 target:15 photoz:2.8052
oid:113669 target:15 photoz:0.2905
oid:4988488 target:15 photoz:0.3234
oid:48246321 target:15 photoz:0.295
oid:81737816 target:15 photoz:0.2241
oid:20829613 target:15 photoz:0.2423
oid:28596342 target:15 photoz:0.6136
oid:7209890 target:15 photoz:0.2743
oid:125618728 target:15 photoz:0.1568
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)

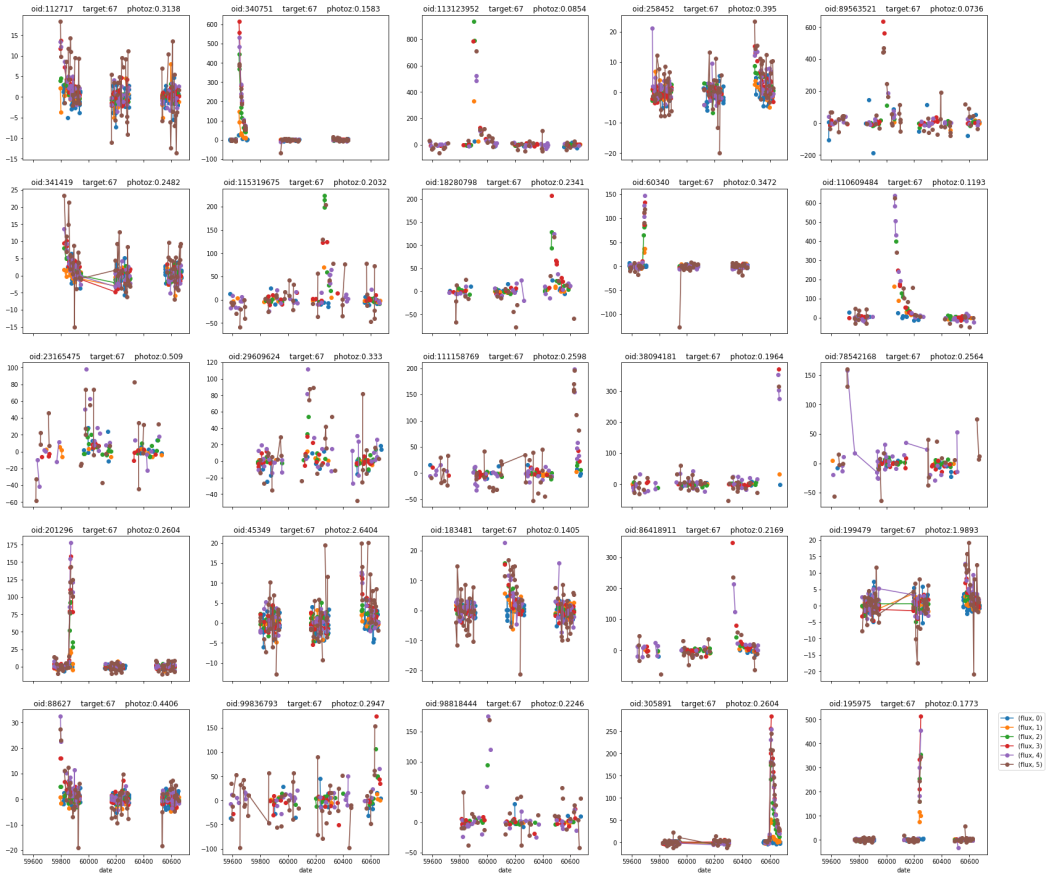

oid:10509087 target:16 photoz:0.0
oid:52616603 target:16 photoz:0.0
oid:44903772 target:16 photoz:0.0
oid:130489916 target:16 photoz:0.0
oid:110099058 target:16 photoz:0.0
oid:130062639 target:16 photoz:0.0
oid:41150627 target:16 photoz:0.0
oid:80569144 target:16 photoz:0.0
oid:40373475 target:16 photoz:0.0
oid:50218120 target:16 photoz:0.0
oid:75011768 target:16 photoz:0.0
oid:87631226 target:16 photoz:0.0
oid:117961865 target:16 photoz:0.0
oid:30505 target:16 photoz:0.0
oid:79653262 target:16 photoz:0.0
oid:63663374 target:16 photoz:0.0
oid:123621973 target:16 photoz:0.0
oid:4798690 target:16 photoz:0.0
oid:95878899 target:16 photoz:0.0
oid:56567051 target:16 photoz:0.0
oid:106438996 target:16 photoz:0.0
oid:93271095 target:16 photoz:0.0
oid:64054152 target:16 photoz:0.0
oid:121404313 target:16 photoz:0.0
oid:79035534 target:16 photoz:0.0
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)

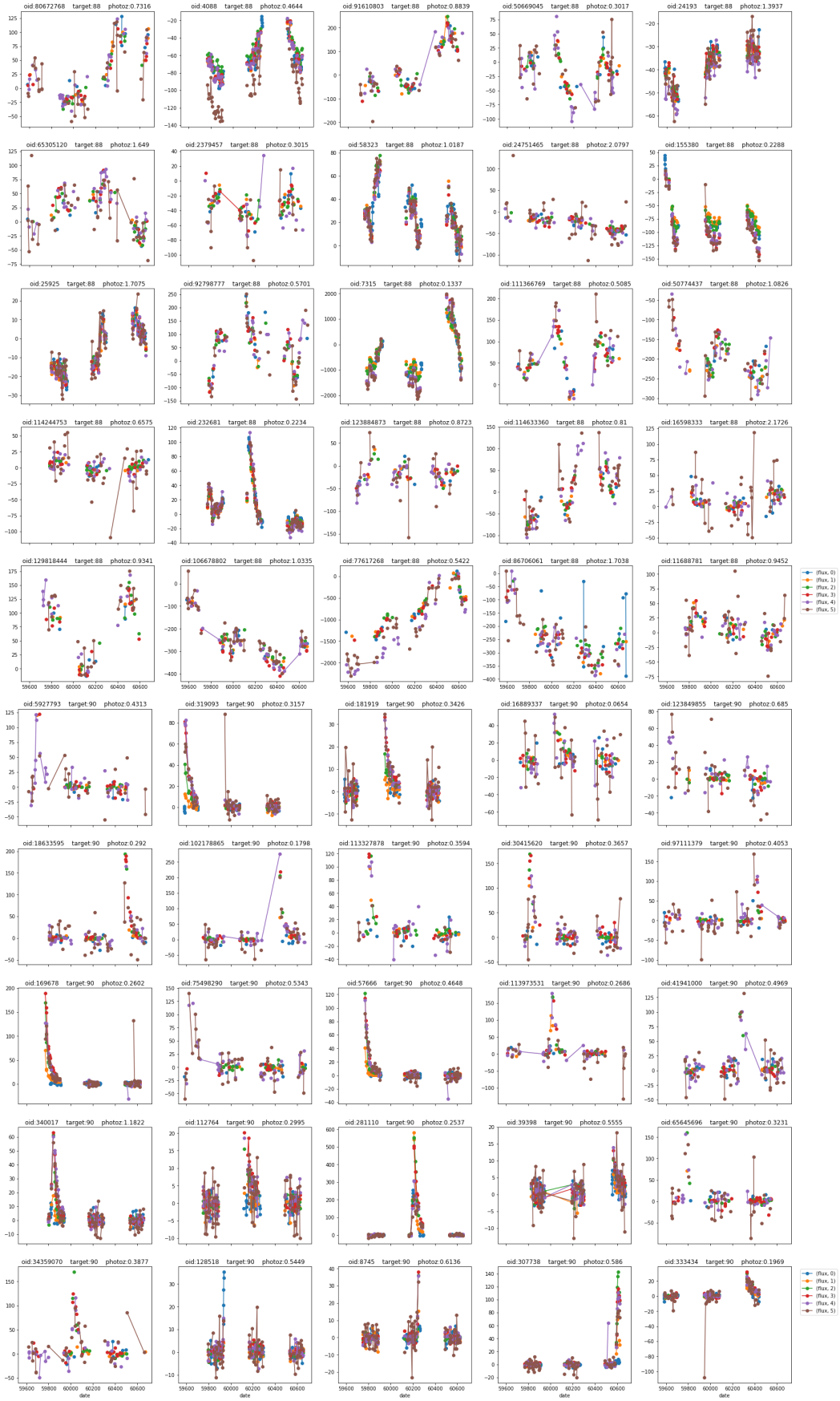

oid:290161 target:42 photoz:0.3643
oid:319901 target:42 photoz:0.1409
oid:69772173 target:42 photoz:0.12
oid:67507321 target:42 photoz:0.4403
oid:62324231 target:42 photoz:2.6887
oid:107836210 target:42 photoz:0.1277
oid:262731 target:42 photoz:0.2285
oid:124402447 target:42 photoz:0.2785
oid:5487470 target:42 photoz:0.1716
oid:203758 target:42 photoz:2.6581
oid:30576273 target:42 photoz:0.189
oid:19347158 target:42 photoz:0.0578
oid:200034 target:42 photoz:0.1713
oid:128488 target:42 photoz:0.1194
oid:35319631 target:42 photoz:0.5195
oid:57839024 target:42 photoz:0.1733
oid:72733015 target:42 photoz:0.0962
oid:165821 target:42 photoz:1.0072
oid:123996080 target:42 photoz:0.1597
oid:30534719 target:42 photoz:0.2951
oid:111601371 target:42 photoz:0.4289
oid:81464 target:42 photoz:0.2818
oid:237164 target:42 photoz:0.047
oid:23602620 target:42 photoz:0.1746
oid:86316940 target:42 photoz:0.2079
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
date
oid:39501380 target:52 photoz:0.2166
oid:106730 target:52 photoz:2.2437
oid:56383332 target:52 photoz:0.0572
oid:264261 target:52 photoz:0.3443
oid:15718 target:52 photoz:2.3179
oid:8698141 target:52 photoz:0.2313
oid:13138 target:52 photoz:0.5192
oid:11492513 target:52 photoz:0.1801
oid:42799805 target:52 photoz:0.2887
oid:53224456 target:52 photoz:0.3461
oid:20916962 target:52 photoz:0.451
oid:112780149 target:52 photoz:0.0777
oid:236699 target:52 photoz:0.2159
oid:96687755 target:52 photoz:0.5783
oid:124679 target:52 photoz:0.3409
oid:117846457 target:52 photoz:0.1802
oid:42637358 target:52 photoz:0.2772
oid:112930693 target:52 photoz:0.1279
oid:80358295 target:52 photoz:2.0607
oid:78165987 target:52 photoz:0.335
oid:41764022 target:52 photoz:2.4335
oid:64248 target:52 photoz:0.171
oid:72601841 target:52 photoz:0.493
oid:87777036 target:52 photoz:0.3036
oid:19496909 target:52 photoz:0.2639
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
date

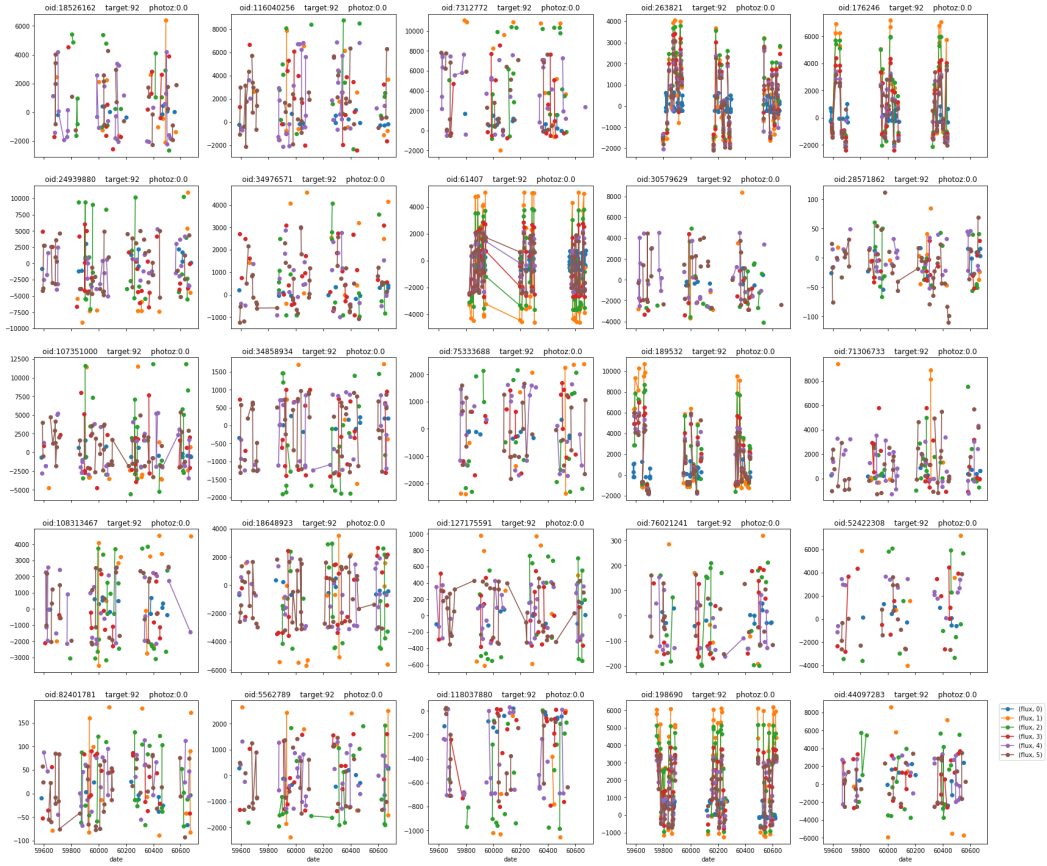

oid:17991828 target:53 photoz:0.0
oid:268977 target:53 photoz:0.0
oid:74062905 target:53 photoz:0.0
oid:4855013 target:53 photoz:0.0
oid:4416529 target:53 photoz:0.0
oid:117510131 target:53 photoz:0.0
oid:106195942 target:53 photoz:0.0
oid:24408486 target:53 photoz:0.0
oid:288194 target:53 photoz:0.0
oid:114163906 target:53 photoz:0.0
oid:99366334 target:53 photoz:0.0
oid:105688990 target:53 photoz:0.0
oid:278480 target:53 photoz:0.0
oid:113409097 target:53 photoz:0.0
oid:118532728 target:53 photoz:0.0
oid:2298767 target:53 photoz:0.0
oid:125642419 target:53 photoz:0.0
oid:93620586 target:53 photoz:0.0
oid:16504681 target:53 photoz:0.0
oid:20578786 target:53 photoz:0.0
oid:97301909 target:53 photoz:0.0
oid:104765443 target:53 photoz:0.0
oid:133773 target:53 photoz:0.0
oid:33834663 target:53 photoz:0.0
oid:97943128 target:53 photoz:0.0
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)

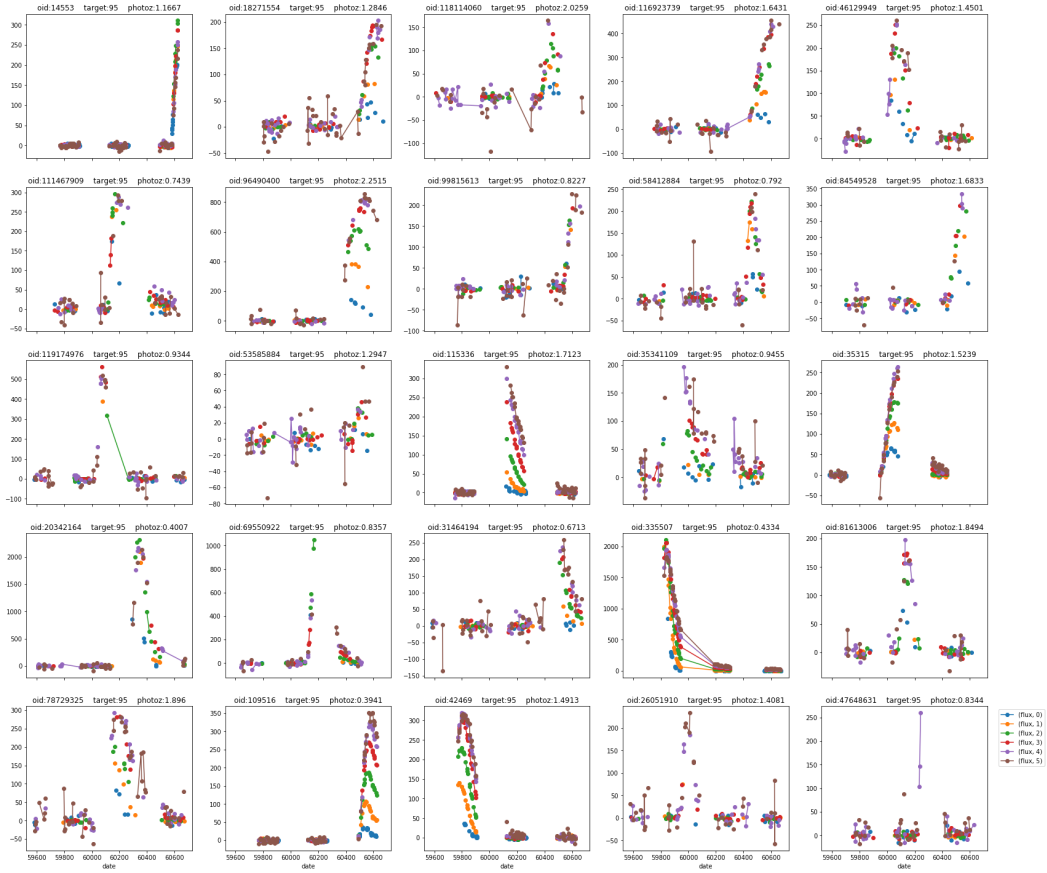

oid:67816252 target:62 photoz:0.082
oid:107636565 target:62 photoz:2.6157
oid:69561279 target:62 photoz:0.233
oid:32195171 target:62 photoz:0.1913
oid:81730840 target:62 photoz:0.2083
oid:26839367 target:62 photoz:0.087
oid:71126 target:62 photoz:0.5146
oid:45895017 target:62 photoz:0.1126
oid:76640730 target:62 photoz:0.0841
oid:65963501 target:62 photoz:0.1382
oid:273938 target:62 photoz:0.4098
oid:5884968 target:62 photoz:0.1104
oid:79052637 target:62 photoz:0.2646
oid:31739726 target:62 photoz:0.3523
oid:104468298 target:62 photoz:0.1976
oid:83278224 target:62 photoz:0.1698
oid:7484291 target:62 photoz:0.2162
oid:79151380 target:62 photoz:0.2707
oid:124100157 target:62 photoz:0.2083
oid:263344 target:62 photoz:0.0683
oid:75499040 target:62 photoz:0.1372
oid:19451710 target:62 photoz:0.0502
oid:105309744 target:62 photoz:0.1785
oid:112969725 target:62 photoz:0.4413
oid:30398950 target:62 photoz:0.0715
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)


oid:89733353 target:64 photoz:0.0754
oid:62187 target:64 photoz:0.1301
oid:47142591 target:64 photoz:0.0248
oid:81456459 target:64 photoz:0.0958
oid:35411122 target:64 photoz:0.0768
oid:139362 target:64 photoz:0.0779
oid:97214939 target:64 photoz:2.3972
oid:19183060 target:64 photoz:0.074
oid:126976895 target:64 photoz:0.1226
oid:61688145 target:64 photoz:0.148
oid:74943698 target:64 photoz:0.0797
oid:110808232 target:64 photoz:0.0512
oid:4539153 target:64 photoz:0.0545
oid:96619113 target:64 photoz:2.281
oid:44564061 target:64 photoz:0.0726
oid:1573501 target:64 photoz:0.0168
oid:84706583 target:64 photoz:0.0504
oid:75080064 target:64 photoz:0.0524
oid:54000531 target:64 photoz:0.079
oid:17958346 target:64 photoz:0.0454
oid:11904502 target:64 photoz:0.0788
oid:93121505 target:64 photoz:2.6378
oid:46213566 target:64 photoz:0.1106
oid:115713701 target:64 photoz:0.0592
oid:121326699 target:64 photoz:0.036
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
date
oid:70816 target:65 photoz:0.0
oid:208357 target:65 photoz:0.0
oid:23687970 target:65 photoz:0.0
oid:165406 target:65 photoz:0.0
oid:107981524 target:65 photoz:0.0
oid:66443977 target:65 photoz:0.0
oid:30066 target:65 photoz:0.0
oid:141334 target:65 photoz:0.0
oid:117495237 target:65 photoz:0.0
oid:82302 target:65 photoz:0.0
oid:89084833 target:65 photoz:0.0
oid:27045293 target:65 photoz:0.0
oid:84777347 target:65 photoz:0.0
oid:55629842 target:65 photoz:0.0
oid:179685 target:65 photoz:0.0
oid:128123284 target:65 photoz:0.0
oid:79428 target:65 photoz:0.0
oid:31294384 target:65 photoz:0.0
oid:120024060 target:65 photoz:0.0
oid:5907921 target:65 photoz:0.0
oid:52166547 target:65 photoz:0.0
oid:72065768 target:65 photoz:0.0
oid:113904322 target:65 photoz:0.0
oid:121429195 target:65 photoz:0.0
oid:88228019 target:65 photoz:0.0
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
date


oid:112717 target:67 photoz:0.3138
oid:340751 target:67 photoz:0.1583
oid:113123952 target:67 photoz:0.0854
oid:258452 target:67 photoz:0.395
oid:89563521 target:67 photoz:0.0736
oid:341419 target:67 photoz:0.2482
oid:115319675 target:67 photoz:0.2032
oid:18280798 target:67 photoz:0.2341
oid:60340 target:67 photoz:0.3472
oid:110609484 target:67 photoz:0.1193
oid:23165475 target:67 photoz:0.509
oid:29609624 target:67 photoz:0.333
oid:111158769 target:67 photoz:0.2598
oid:38094181 target:67 photoz:0.1964
oid:78542168 target:67 photoz:0.2564
oid:201296 target:67 photoz:0.2604
oid:45349 target:67 photoz:2.6404
oid:183481 target:67 photoz:0.1405
oid:86418911 target:67 photoz:0.2169
oid:199479 target:67 photoz:1.9893
oid:88627 target:67 photoz:0.4406
oid:99836793 target:67 photoz:0.2947
oid:98818444 target:67 photoz:0.2246
oid:305891 target:67 photoz:0.2604
oid:195975 target:67 photoz:0.1773
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)


oid:80672768 target:88 photoz:0.7316
oid:4088 target:88 photoz:0.4644
oid:91610803 target:88 photoz:0.8839
oid:50669045 target:88 photoz:0.3017
oid:24193 target:88 photoz:1.3937
oid:65305120 target:88 photoz:1.649
oid:2379457 target:88 photoz:0.3015
oid:58323 target:88 photoz:1.0187
oid:24751465 target:88 photoz:2.0797
oid:155380 target:88 photoz:0.2288
oid:25925 target:88 photoz:1.7075
oid:92798777 target:88 photoz:0.5701
oid:7315 target:88 photoz:0.1337
oid:111366769 target:88 photoz:0.5085
oid:50774437 target:88 photoz:1.0826
oid:114244753 target:88 photoz:0.6575
oid:232681 target:88 photoz:0.2234
oid:123884873 target:88 photoz:0.8723
oid:114633360 target:88 photoz:0.81
oid:16598333 target:88 photoz:2.1726
oid:129818444 target:88 photoz:0.9341
oid:106678802 target:88 photoz:1.0335
oid:77617268 target:88 photoz:0.5422
oid:86706061 target:88 photoz:1.7038
oid:11688781 target:88 photoz:0.9452
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
oid:5927793 target:90 photoz:0.4313
oid:319093 target:90 photoz:0.3157
oid:181919 target:90 photoz:0.3426
oid:16889337 target:90 photoz:0.0654
oid:123849855 target:90 photoz:0.685
oid:18633595 target:90 photoz:0.292
oid:102178865 target:90 photoz:0.1798
oid:113327878 target:90 photoz:0.3594
oid:30415620 target:90 photoz:0.3657
oid:97111379 target:90 photoz:0.4053
oid:169678 target:90 photoz:0.2602
oid:75498290 target:90 photoz:0.5343
oid:57666 target:90 photoz:0.4648
oid:113973531 target:90 photoz:0.2686
oid:41941000 target:90 photoz:0.4969
oid:340017 target:90 photoz:1.1822
oid:112764 target:90 photoz:0.2995
oid:281110 target:90 photoz:0.2537
oid:39398 target:90 photoz:0.5555
oid:65645696 target:90 photoz:0.3231
oid:34359070 target:90 photoz:0.3877
oid:128518 target:90 photoz:0.5449
oid:8745 target:90 photoz:0.6136
oid:307738 target:90 photoz:0.586
oid:333434 target:90 photoz:0.1969
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)
date


oid:18526162 target:92 photoz:0.0
oid:116040256 target:92 photoz:0.0
oid:7312772 target:92 photoz:0.0
oid:263821 target:92 photoz:0.0
oid:176246 target:92 photoz:0.0
oid:24939880 target:92 photoz:0.0
oid:34976571 target:92 photoz:0.0
oid:61407 target:92 photoz:0.0
oid:30579629 target:92 photoz:0.0
oid:28571862 target:92 photoz:0.0
oid:107351000 target:92 photoz:0.0
oid:34858934 target:92 photoz:0.0
oid:75333688 target:92 photoz:0.0
oid:189532 target:92 photoz:0.0
oid:71306733 target:92 photoz:0.0
oid:108313467 target:92 photoz:0.0
oid:18648923 target:92 photoz:0.0
oid:127175591 target:92 photoz:0.0
oid:76021241 target:92 photoz:0.0
oid:52422308 target:92 photoz:0.0
oid:82401781 target:92 photoz:0.0
oid:5562789 target:92 photoz:0.0
oid:118037880 target:92 photoz:0.0
oid:198690 target:92 photoz:0.0
oid:44097283 target:92 photoz:0.0
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)


oid:14553 target:95 photoz:1.1667
oid:18271554 target:95 photoz:1.2846
oid:118114060 target:95 photoz:2.0259
oid:116923739 target:95 photoz:1.6431
oid:46129949 target:95 photoz:1.4501
oid:111467909 target:95 photoz:0.7439
oid:96490400 target:95 photoz:2.2515
oid:99815613 target:95 photoz:0.8227
oid:58412884 target:95 photoz:0.792
oid:84549528 target:95 photoz:1.6833
oid:119174976 target:95 photoz:0.9344
oid:53585884 target:95 photoz:1.2947
oid:115336 target:95 photoz:1.7123
oid:35341109 target:95 photoz:0.9455
oid:35315 target:95 photoz:1.5239
oid:20342164 target:95 photoz:0.4007
oid:69550922 target:95 photoz:0.8357
oid:31464194 target:95 photoz:0.6713
oid:335507 target:95 photoz:0.4334
oid:81613006 target:95 photoz:1.8494
oid:78729325 target:95 photoz:1.896
oid:109516 target:95 photoz:0.3941
oid:42469 target:95 photoz:1.4913
oid:26051910 target:95 photoz:1.4081
oid:47648631 target:95 photoz:0.8344
date
(flux, 0)
(flux, 1)
(flux, 2)
(flux, 3)
(flux, 4)
(flux, 5)

In [ ]:

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