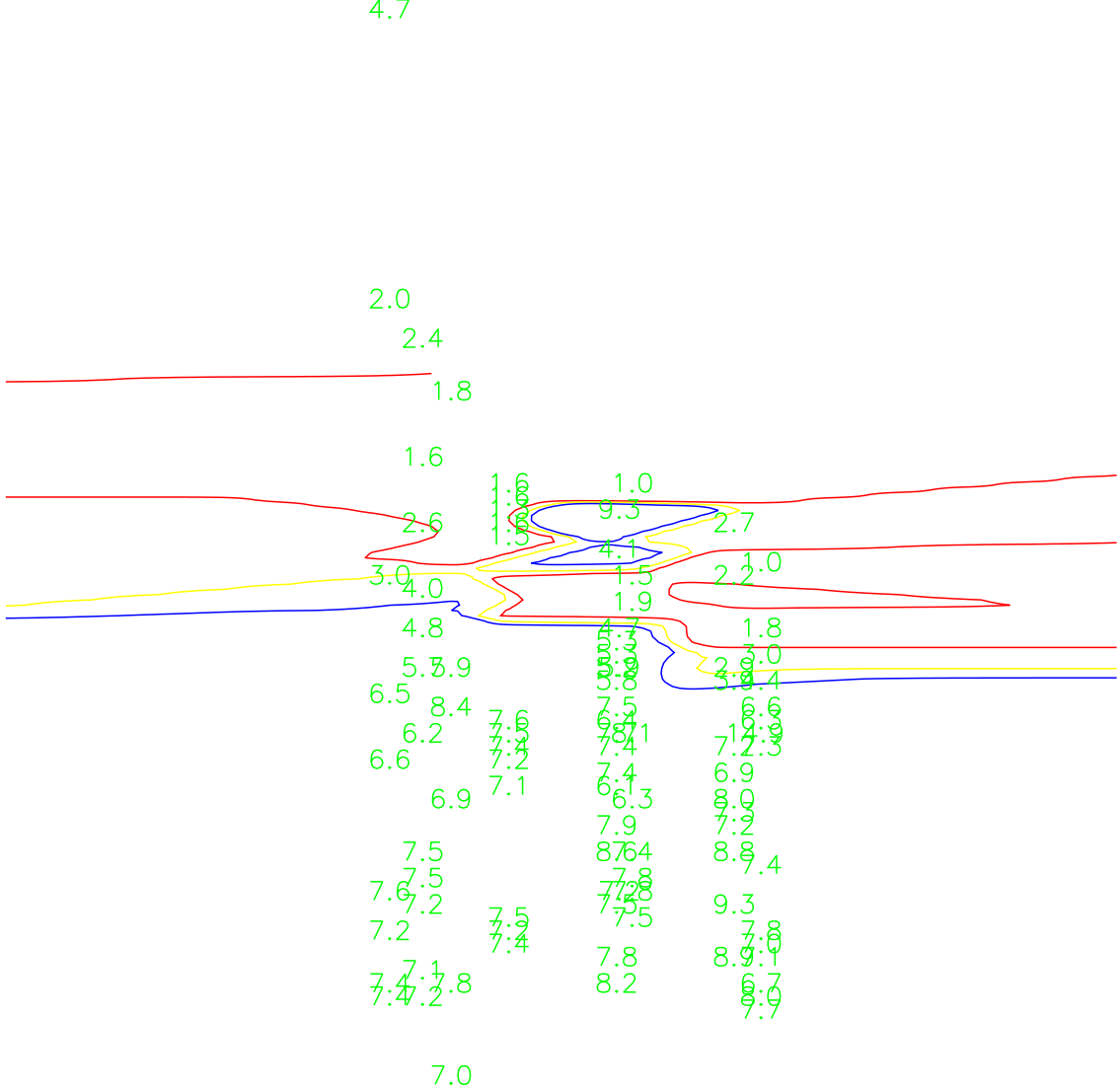
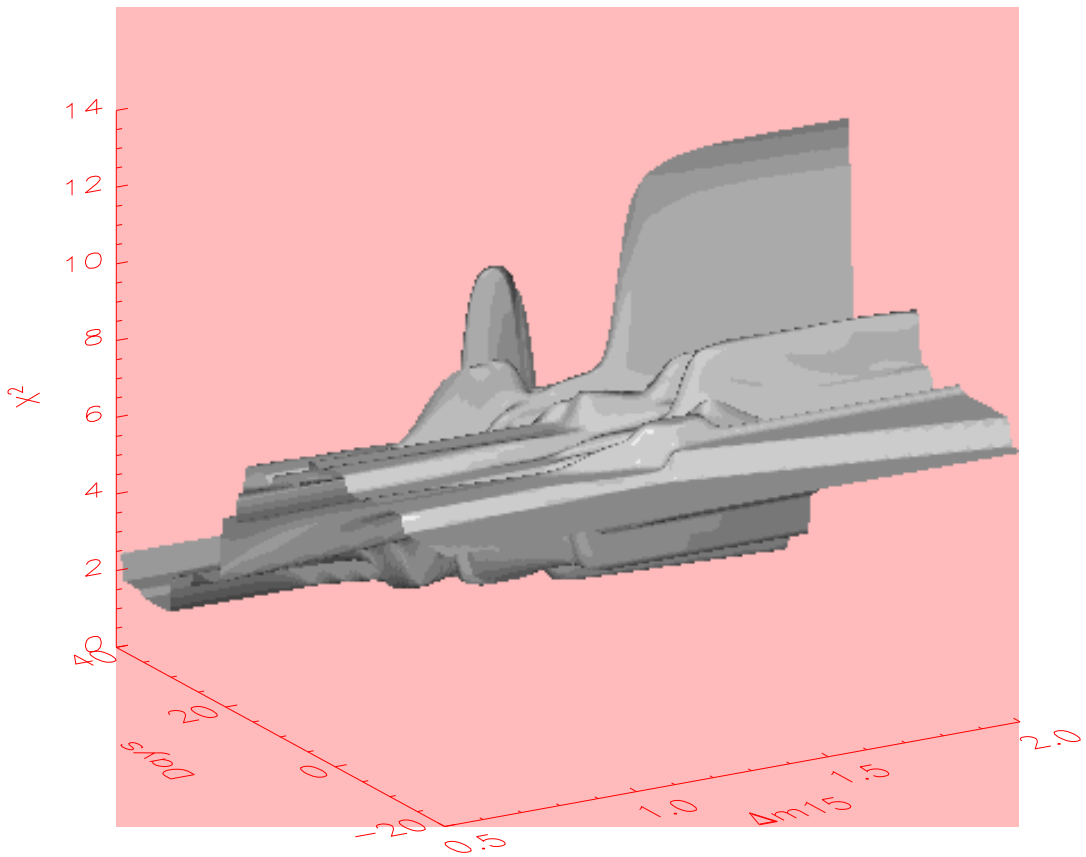
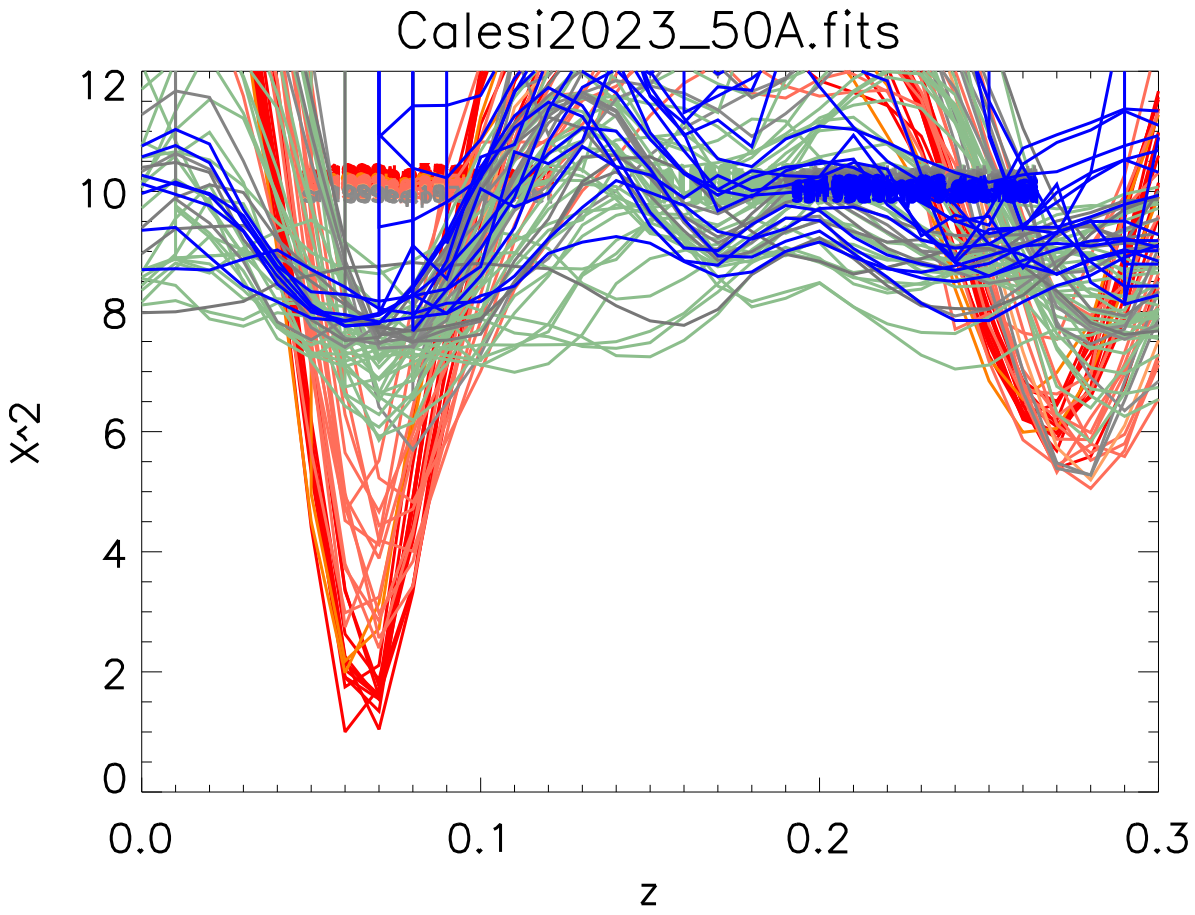




14
12
10
8
6
4
2
0
χ^2
40
20
0
−20
Days
0.5
1.0
1.5
2.0
Δm15


Calesi2023_50A.fits
X^2
z
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10
12
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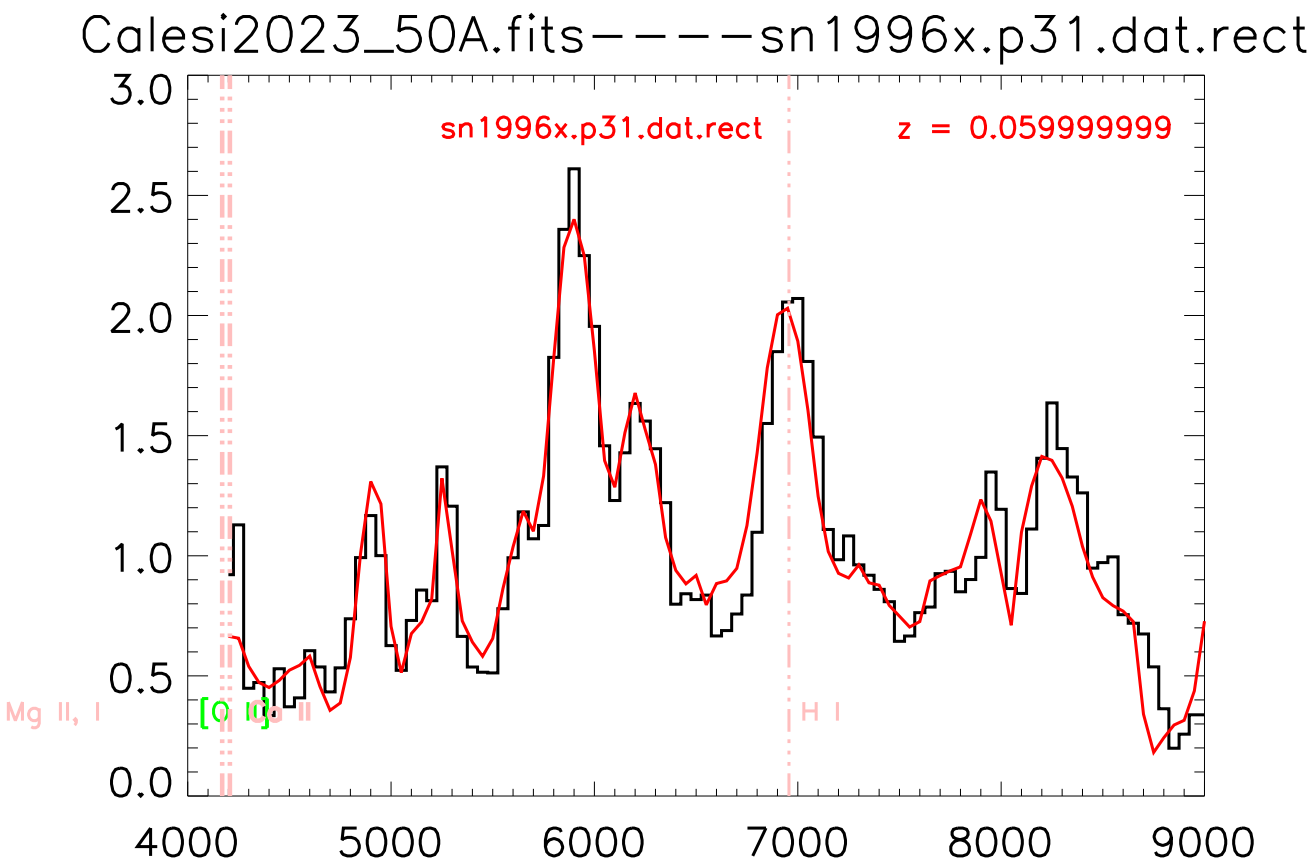
0.2
0.3


Calesi2023_50A.fits----sn1996x.p31.dat.rect
sn1996x.p31.dat.rect
z = 0.059999999
Mg II, I
[O II]
H I
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2.0
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8000
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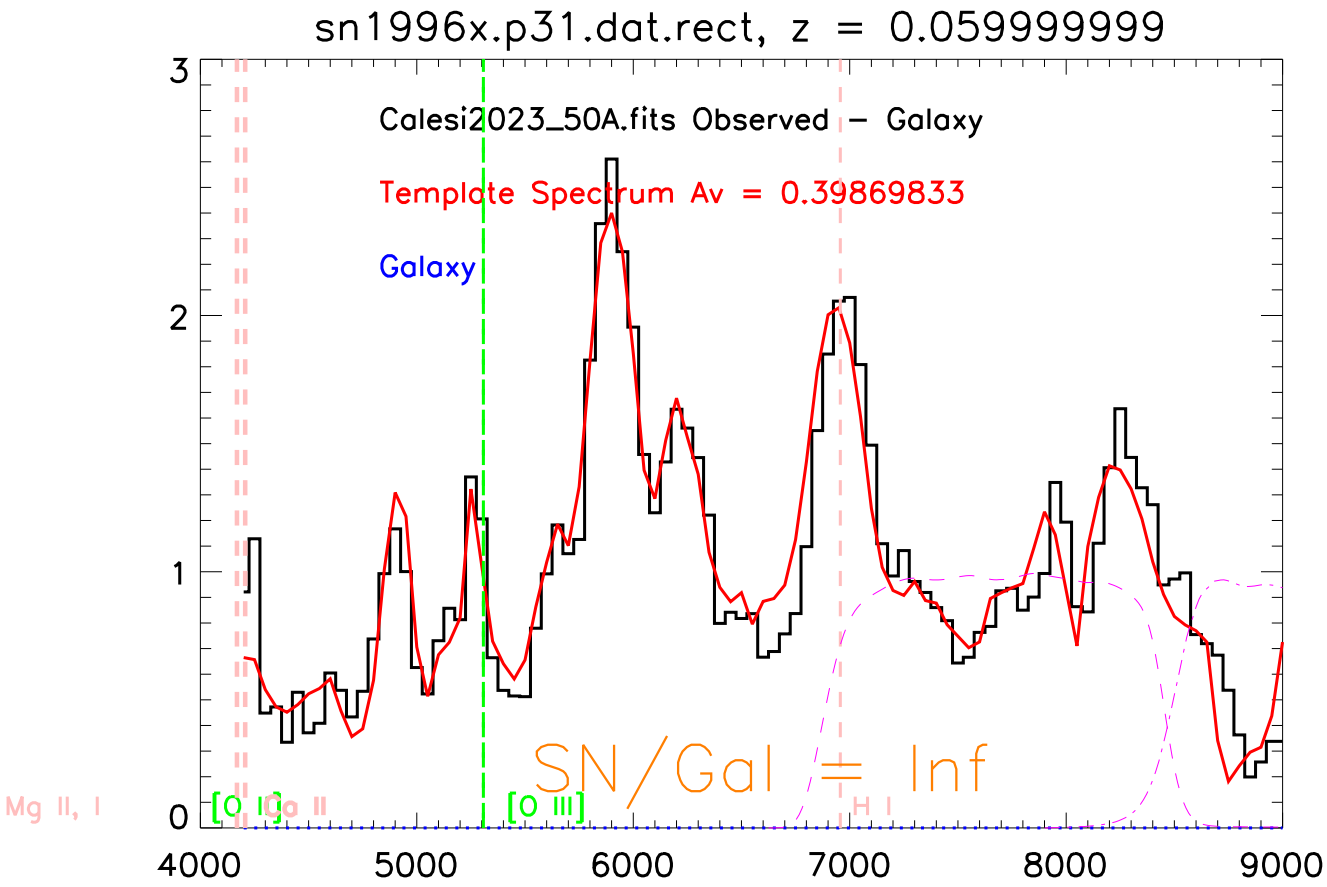
sn1996x.p31.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 0.39869833
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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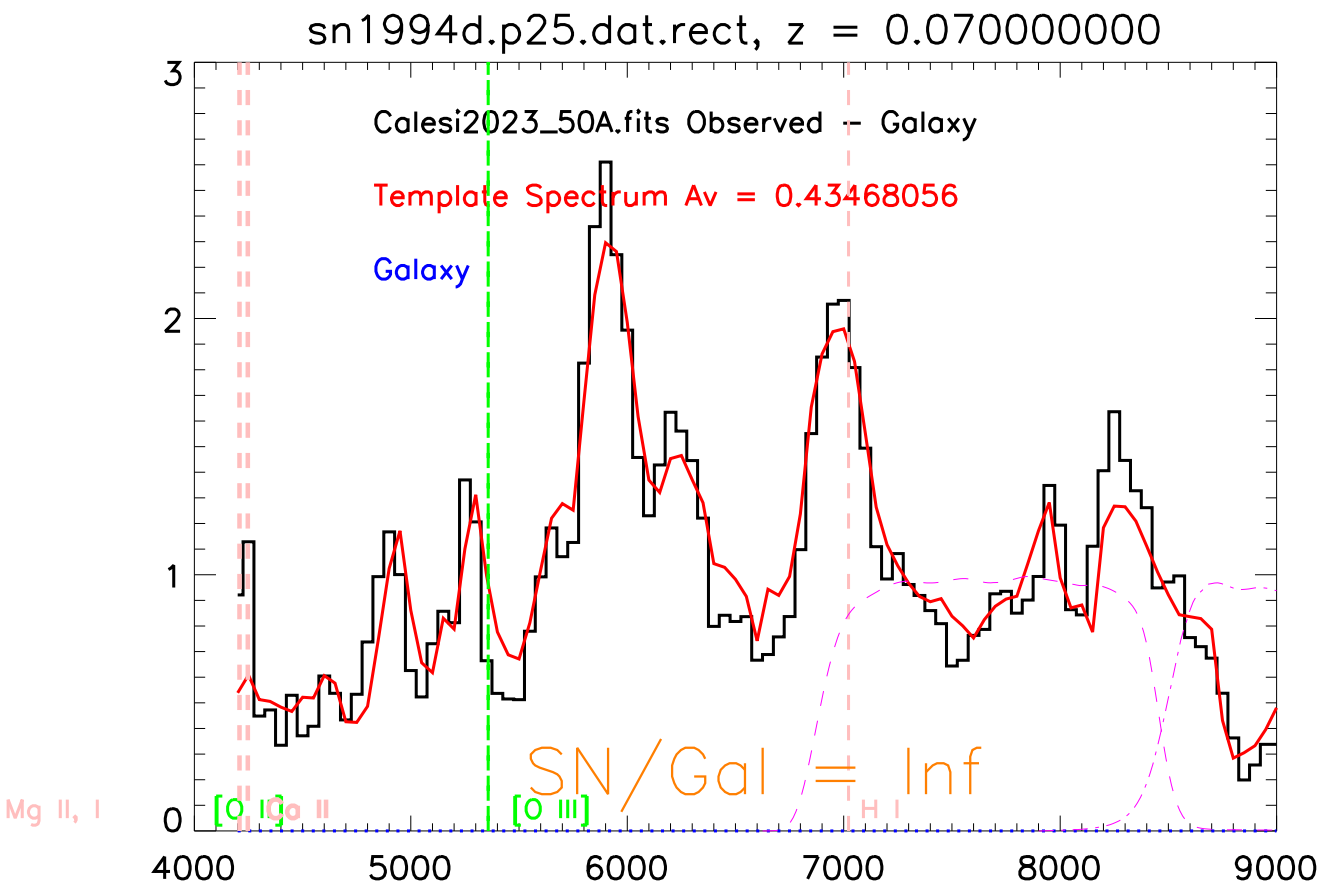
sn1994d.p25.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 0.43468056
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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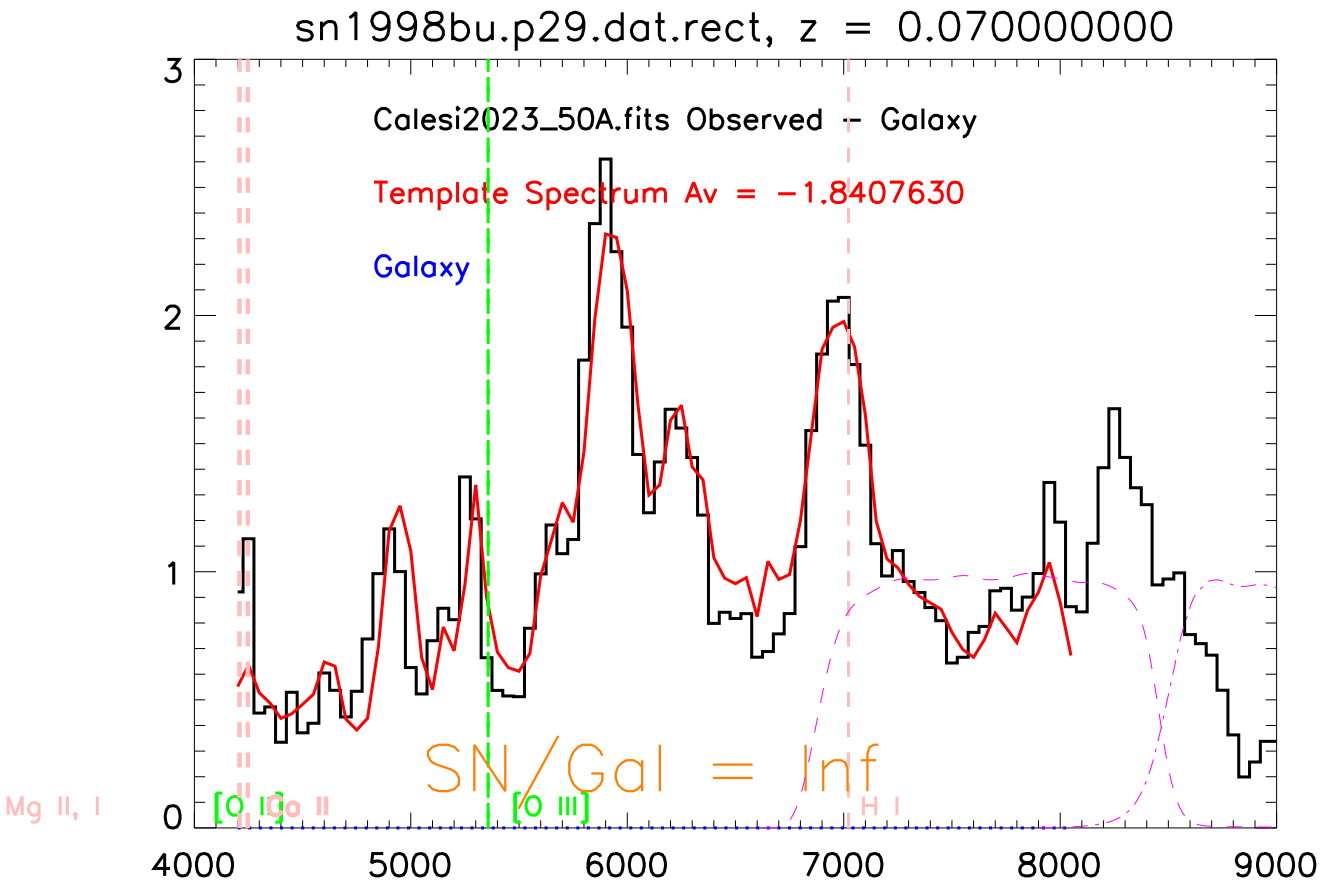
sn1998bu.p29.dat.rect, z = 0.070000000
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Template Spectrum Av = -1.8407630
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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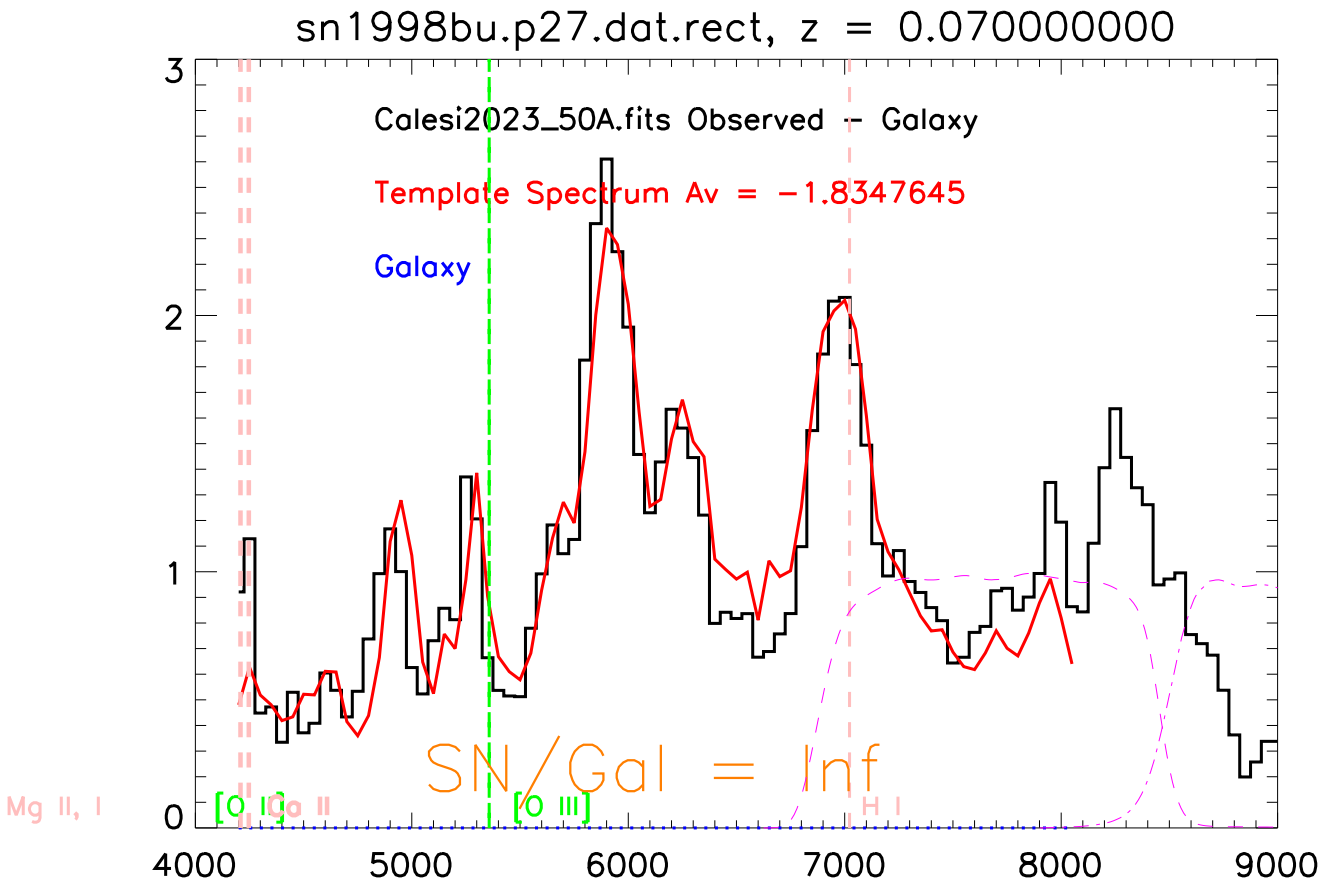
sn1998bu.p27.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -1.8347645
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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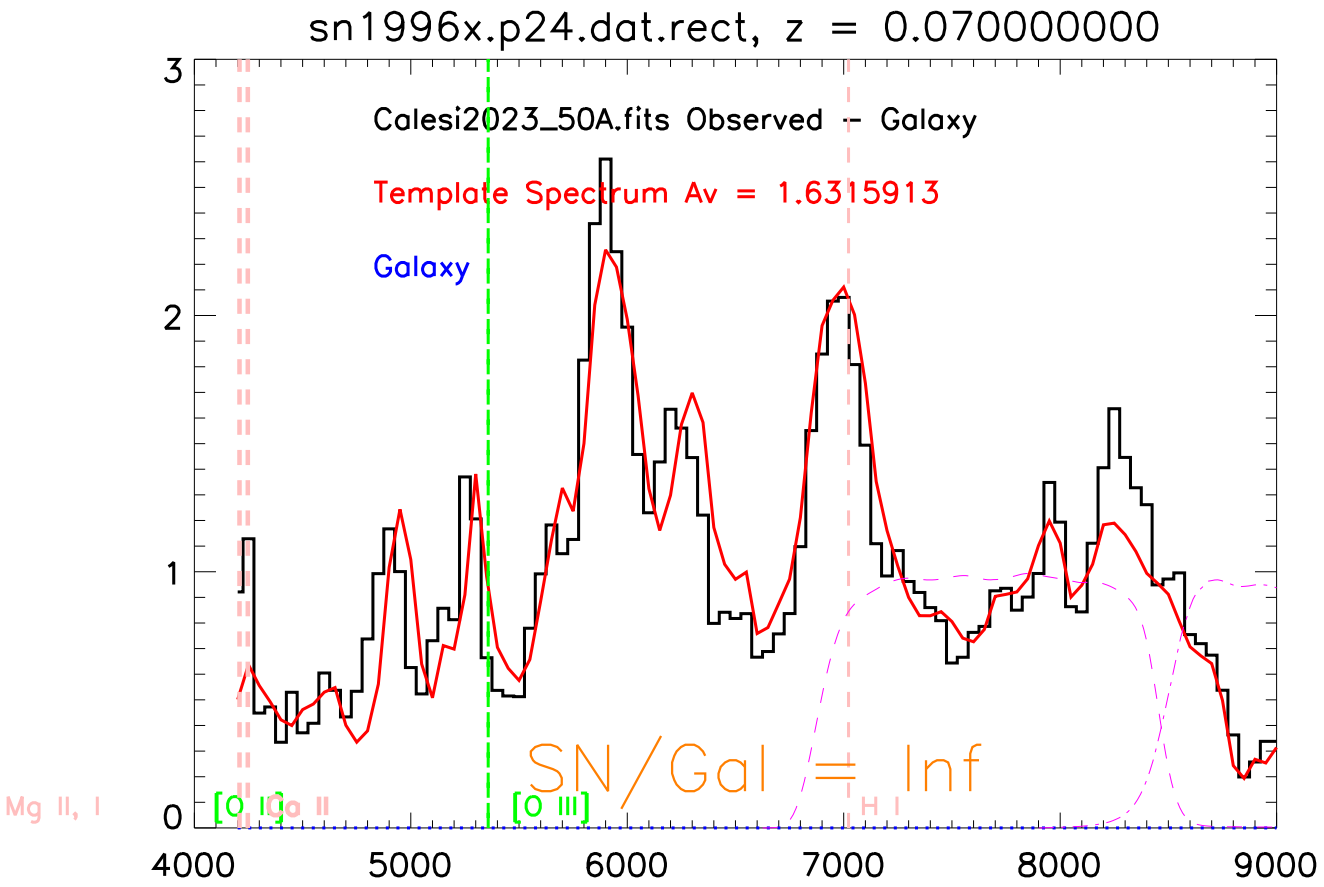
sn1996x.p24.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.6315913
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SN/Gal = Inf
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[O III]
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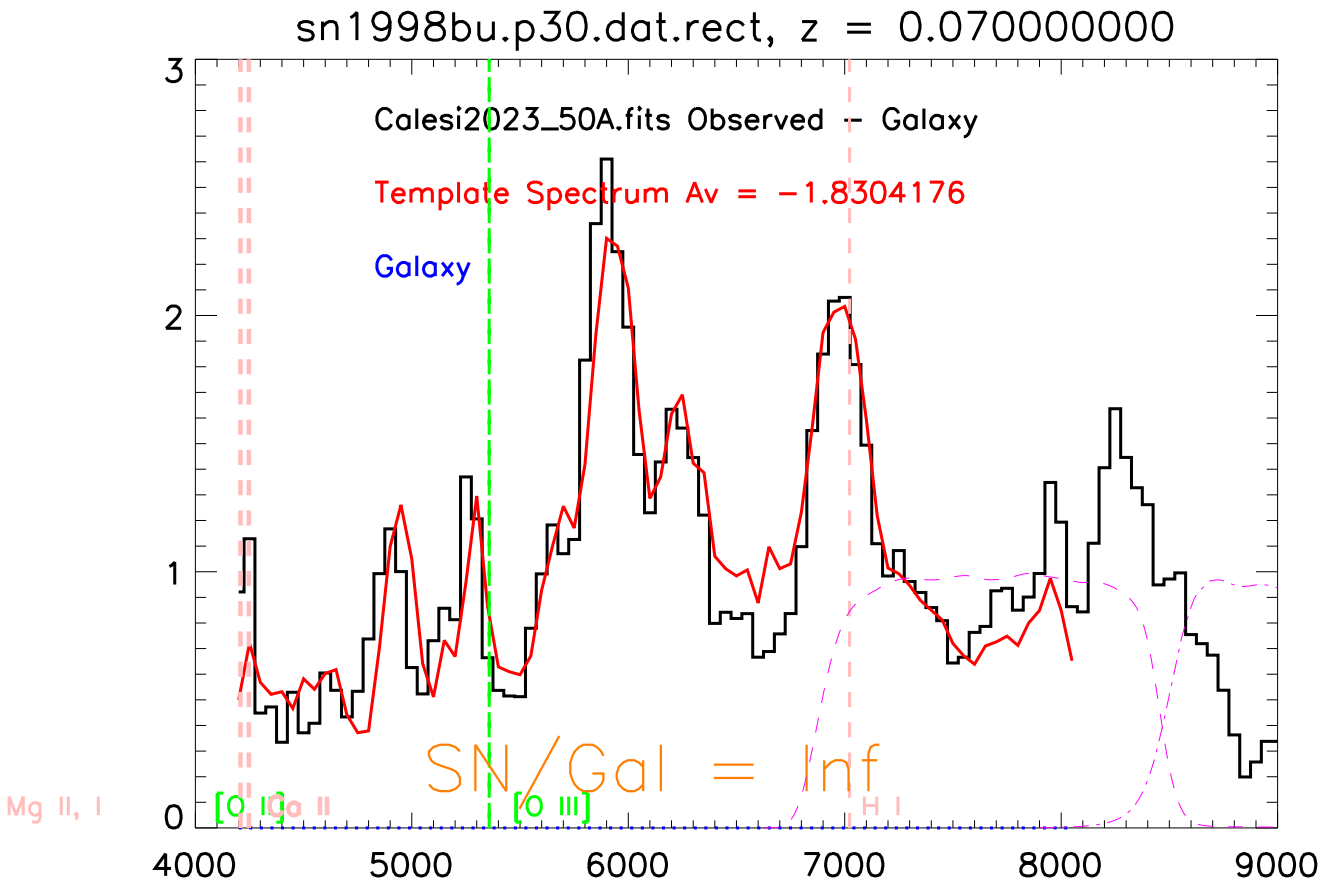
sn1998bu.p30.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -1.8304176
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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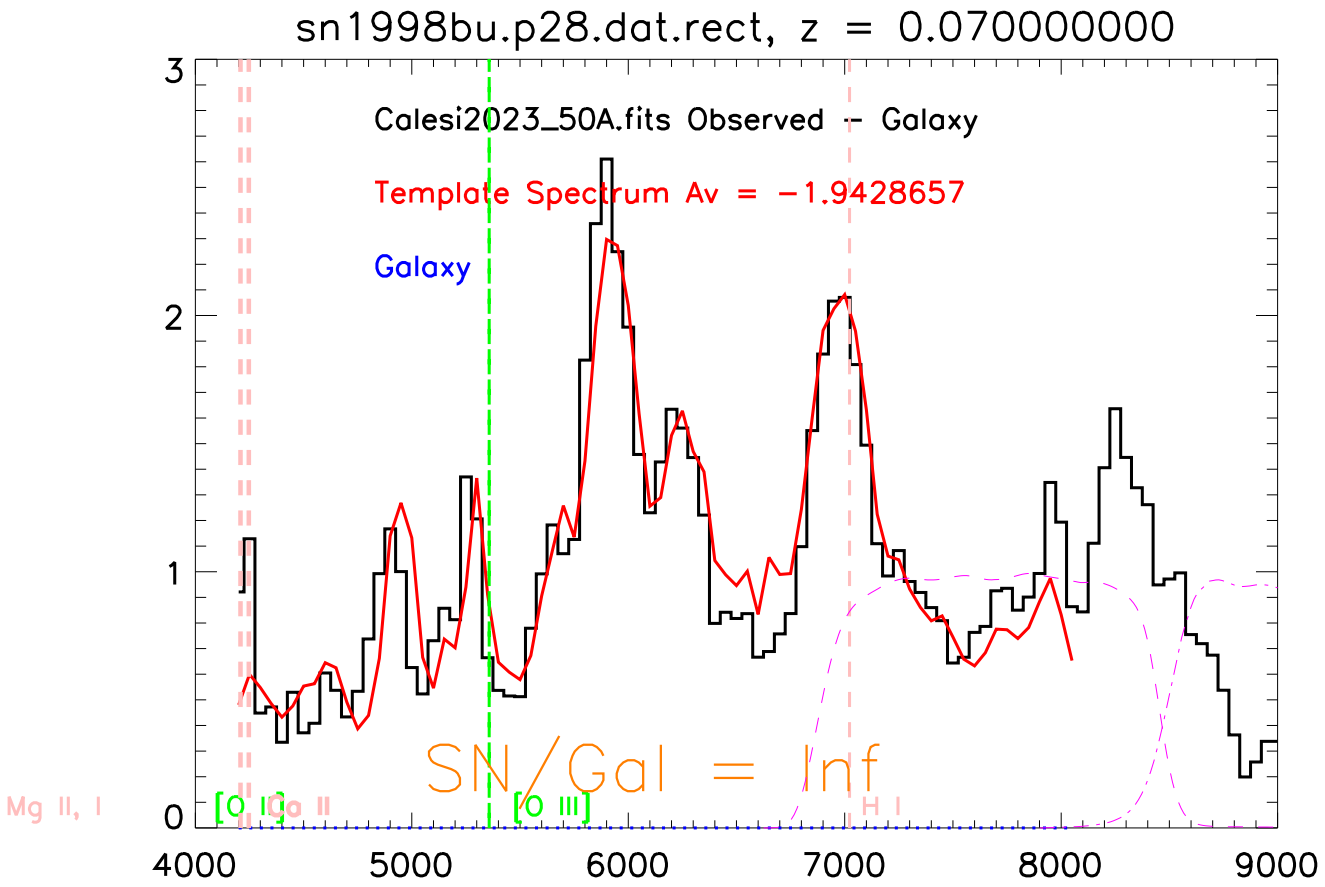
sn1998bu.p28.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -1.9428657
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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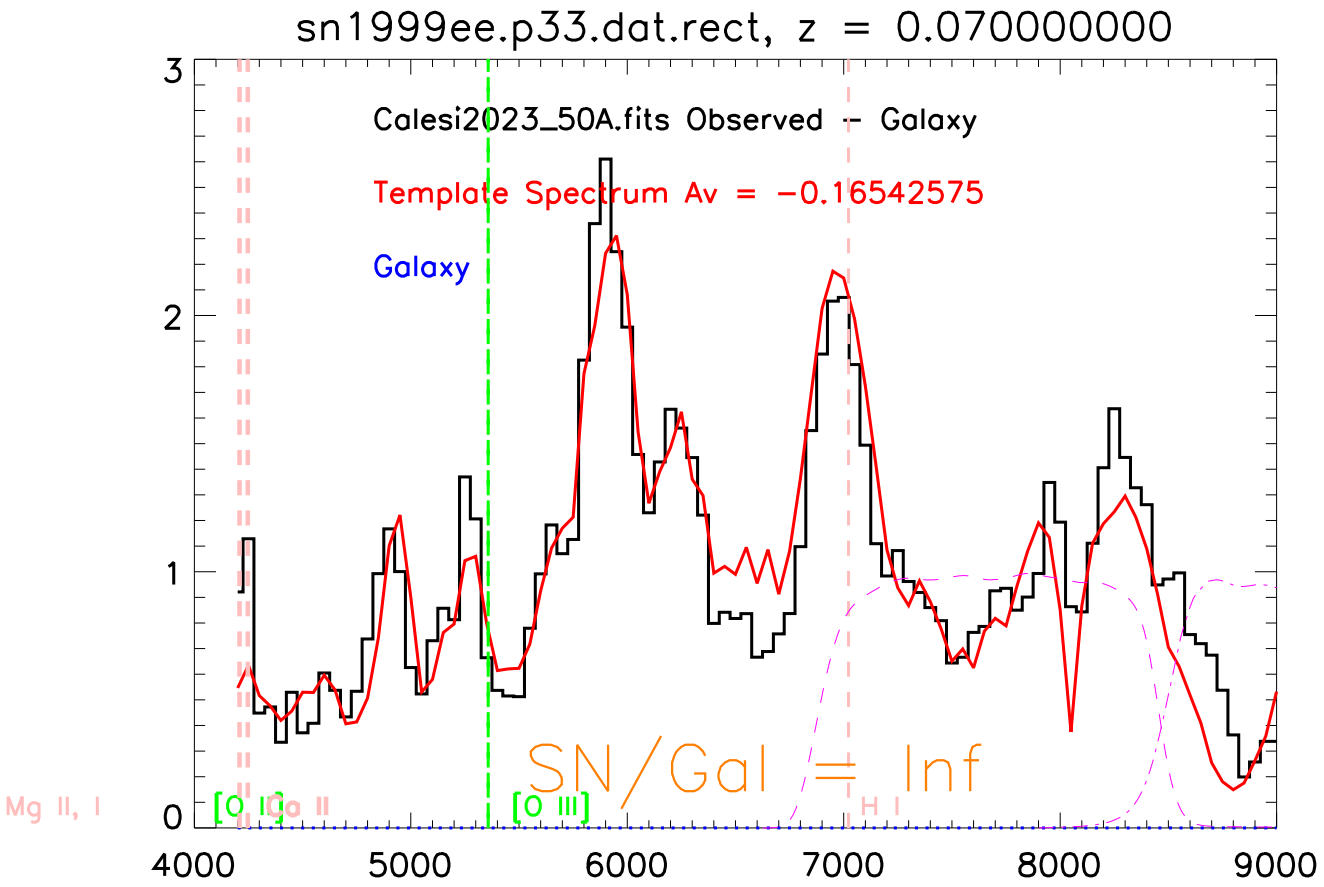
sn1999ee.p33.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -0.16542575
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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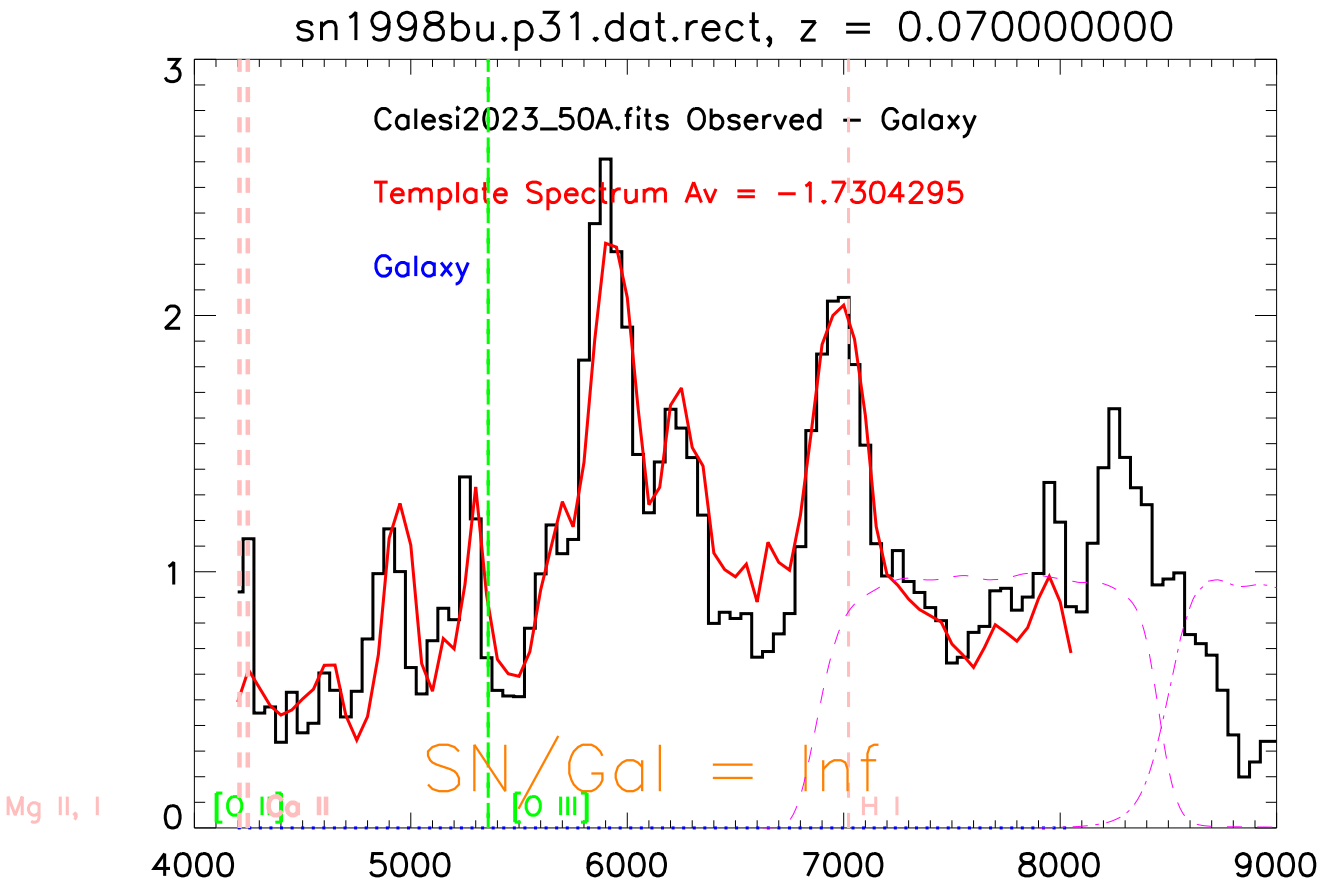
sn1998bu.p31.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -1.7304295
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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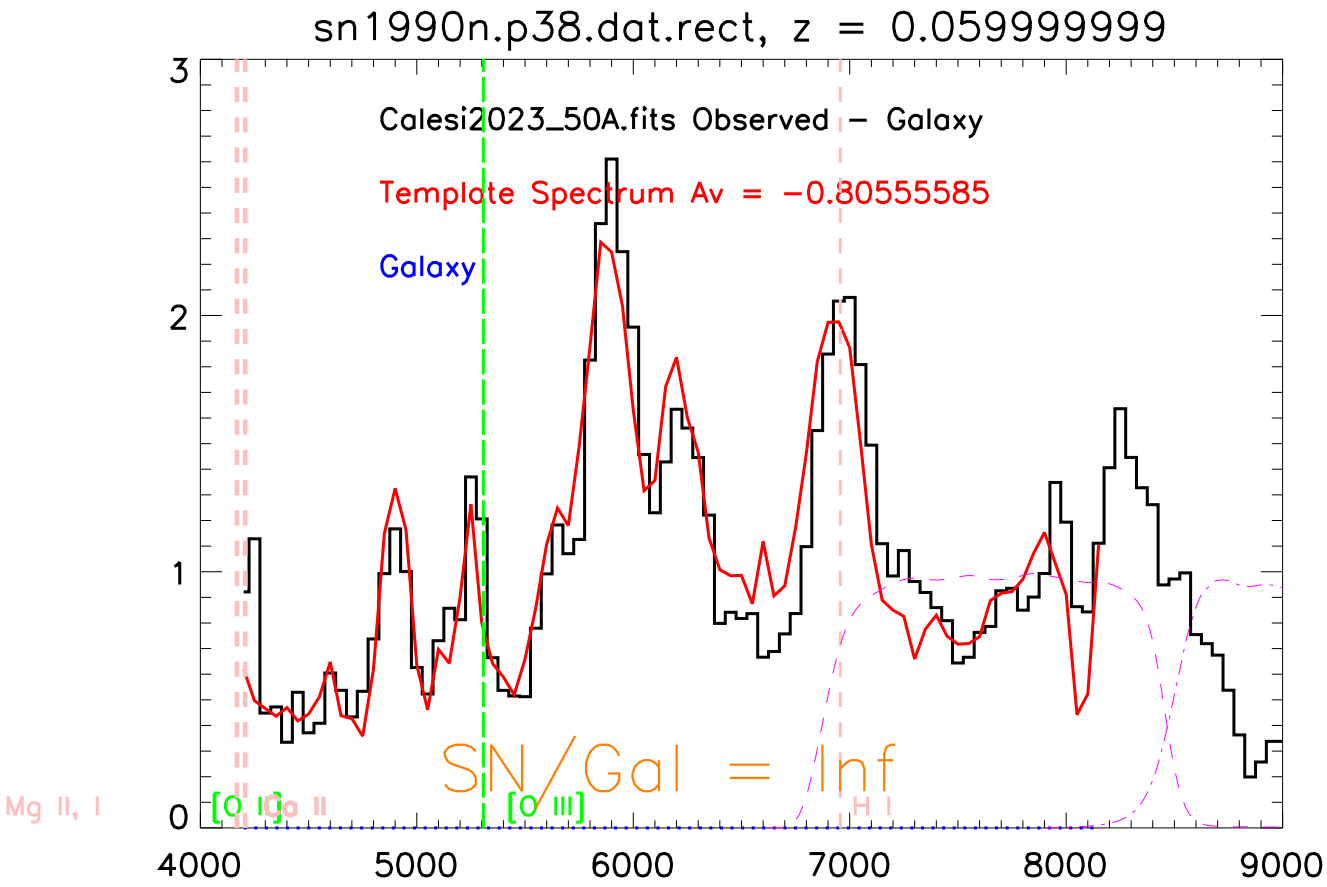
sn1990n.p38.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = −0.80555585
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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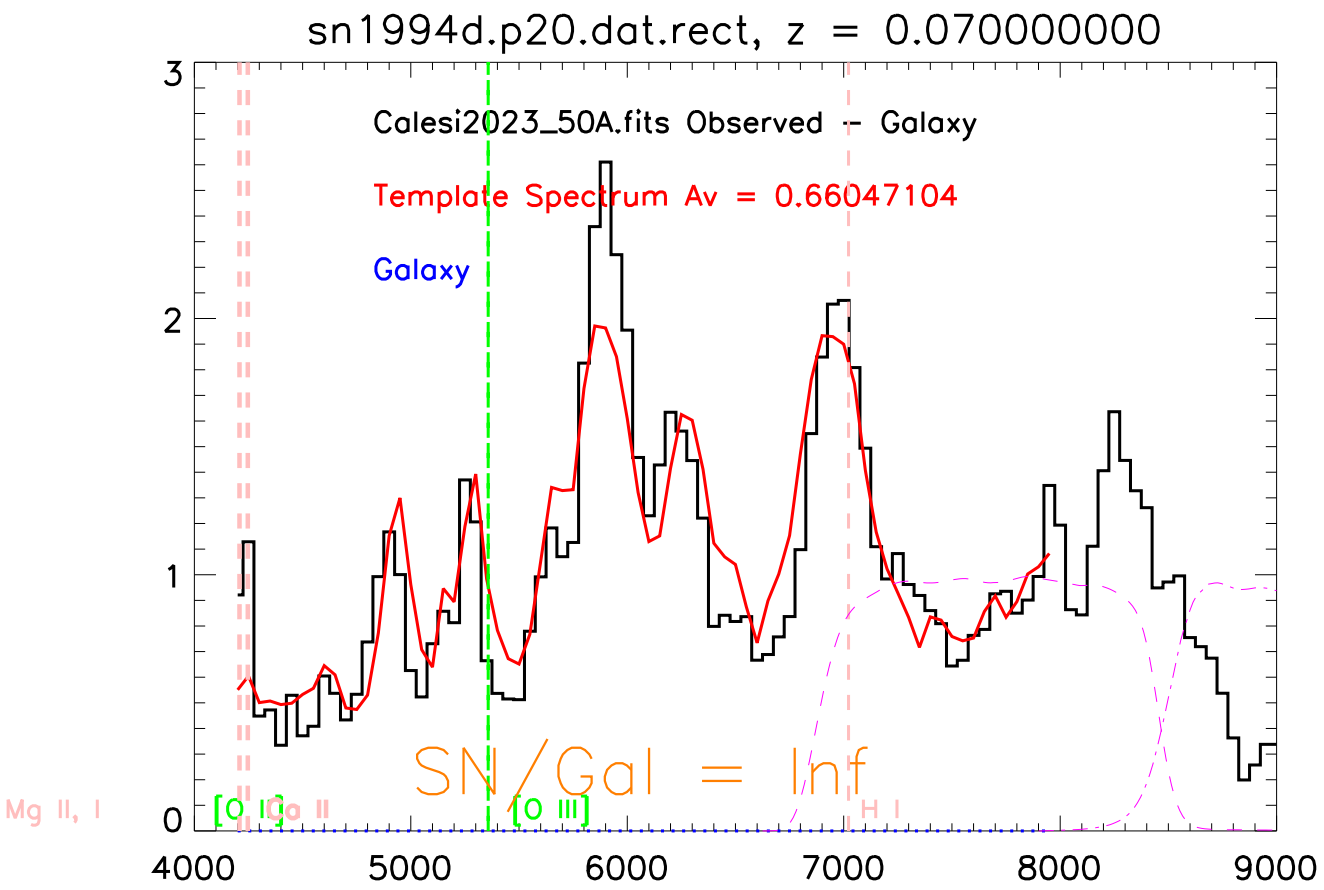
sn1994d.p20.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 0.66047104
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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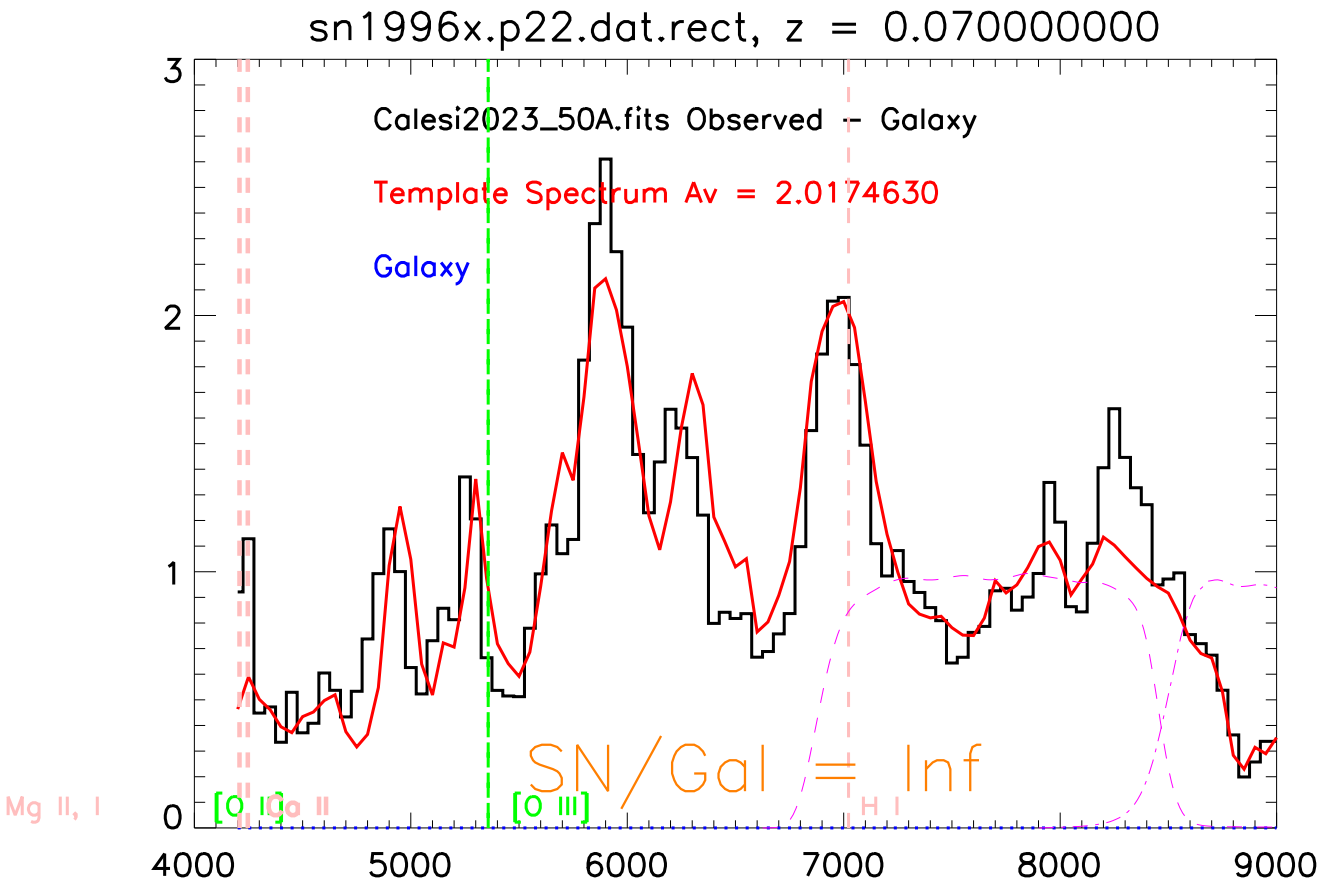
sn1996x.p22.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 2.0174630
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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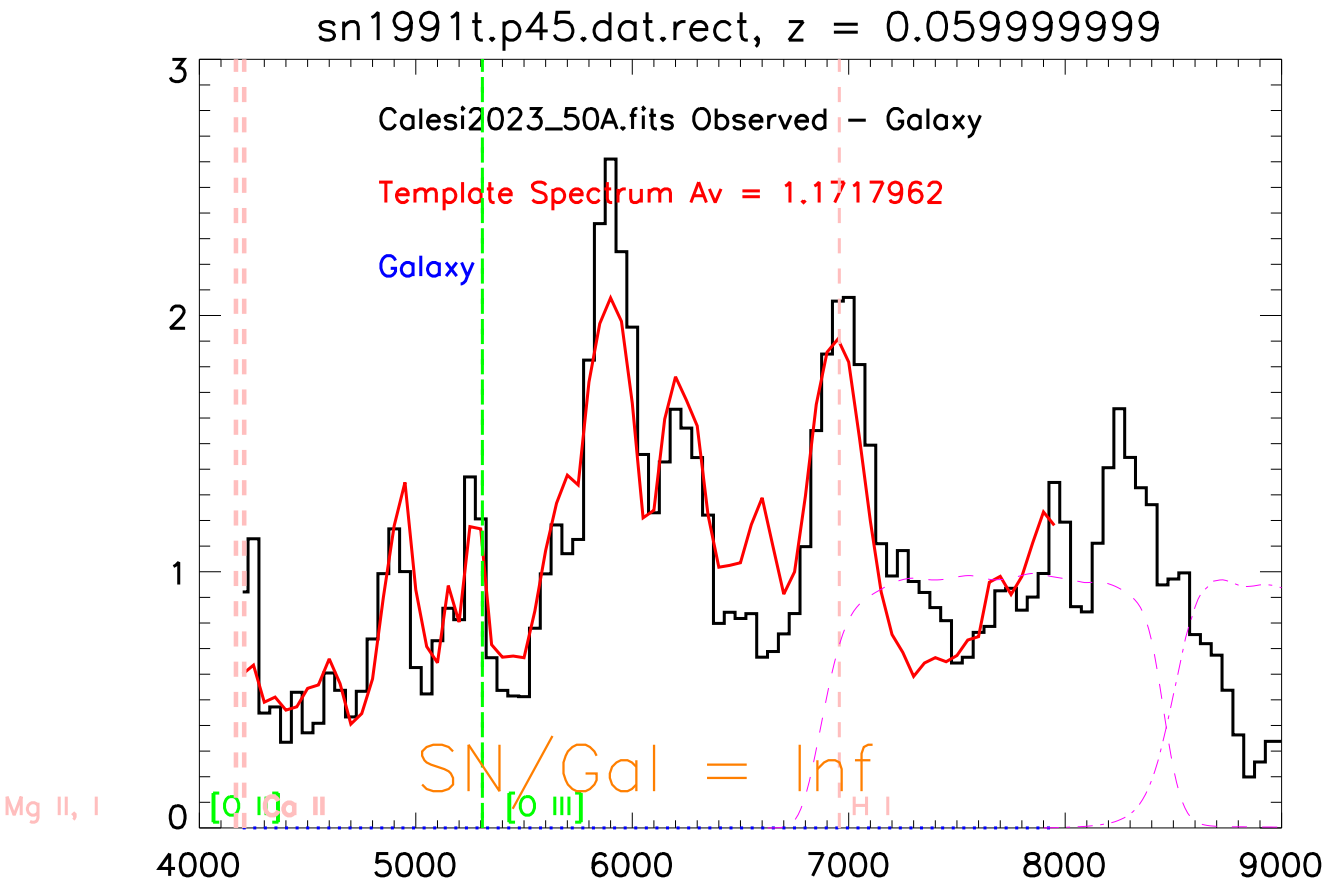
sn1991t.p45.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 1.1717962
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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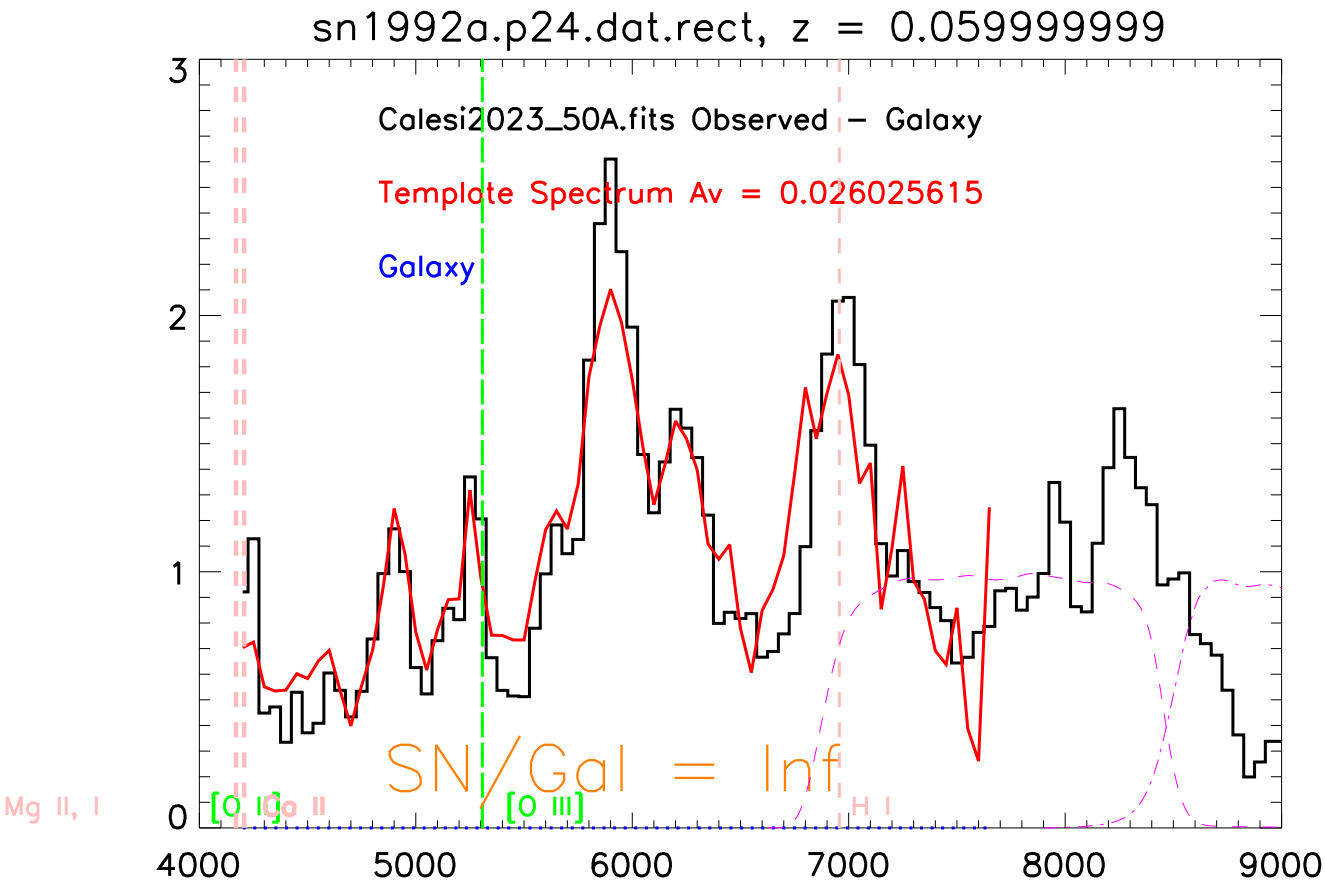
sn1992a.p24.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 0.026025615
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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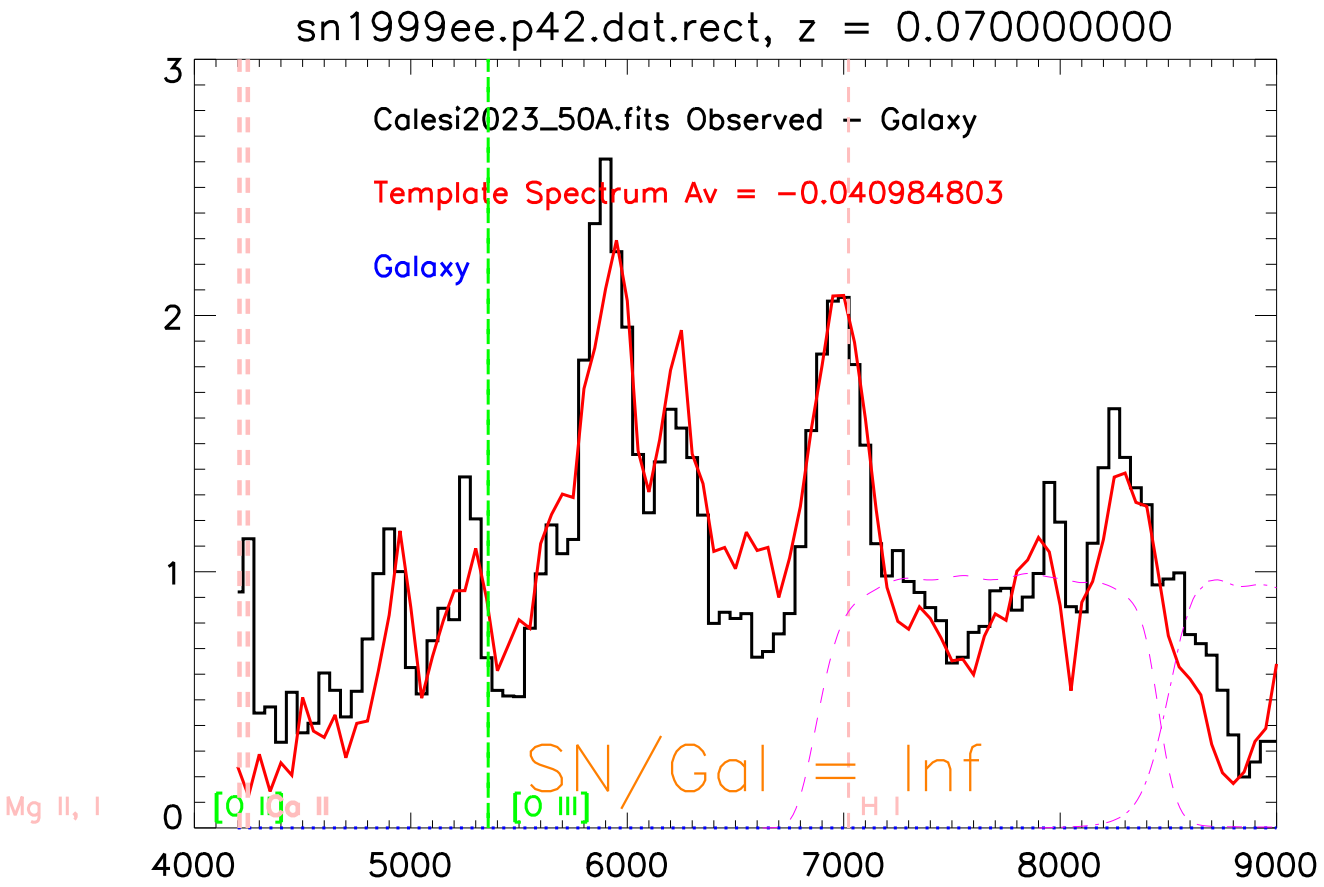
sn1999ee.p42.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = -0.040984803
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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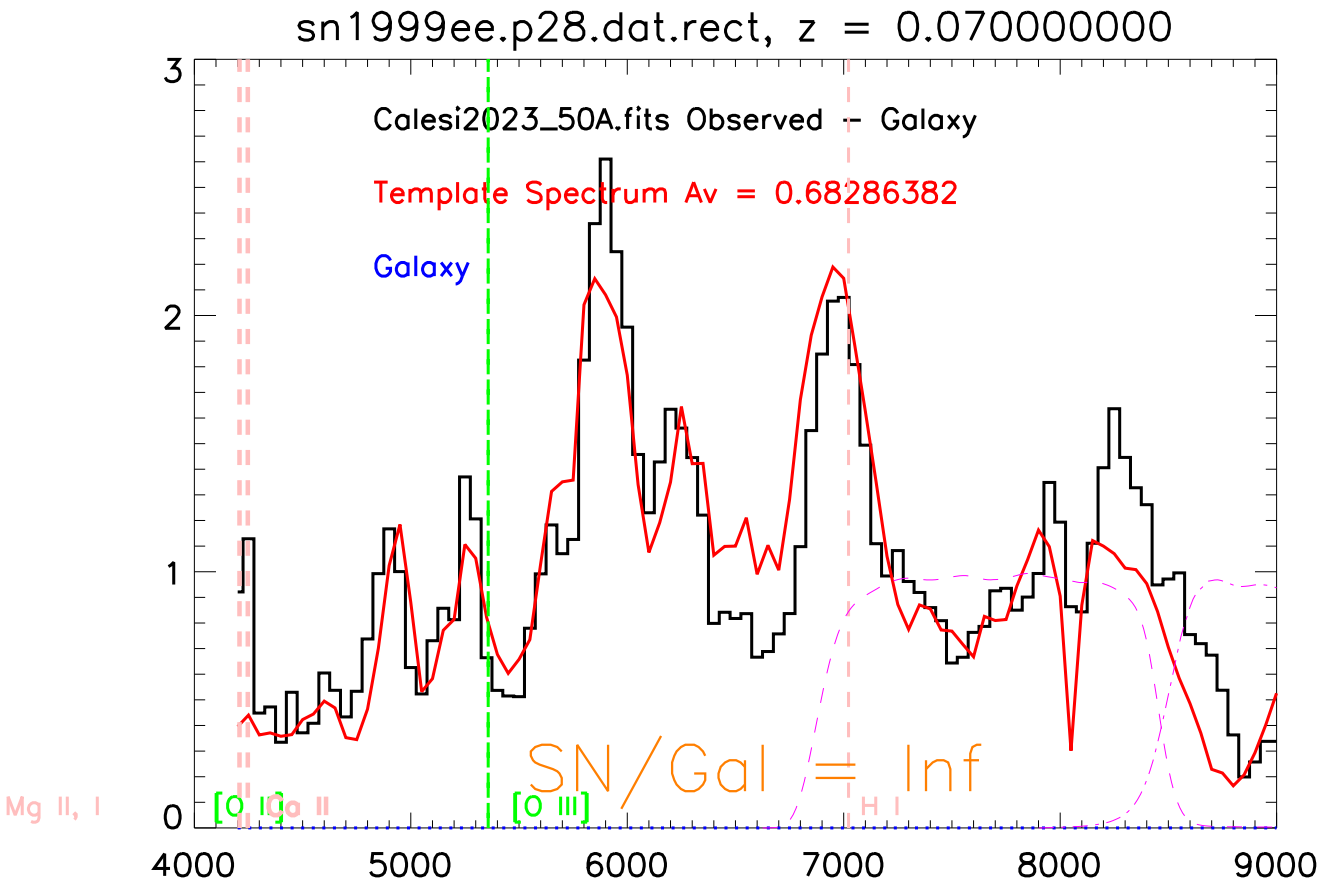
sn1999ee.p28.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 0.68286382
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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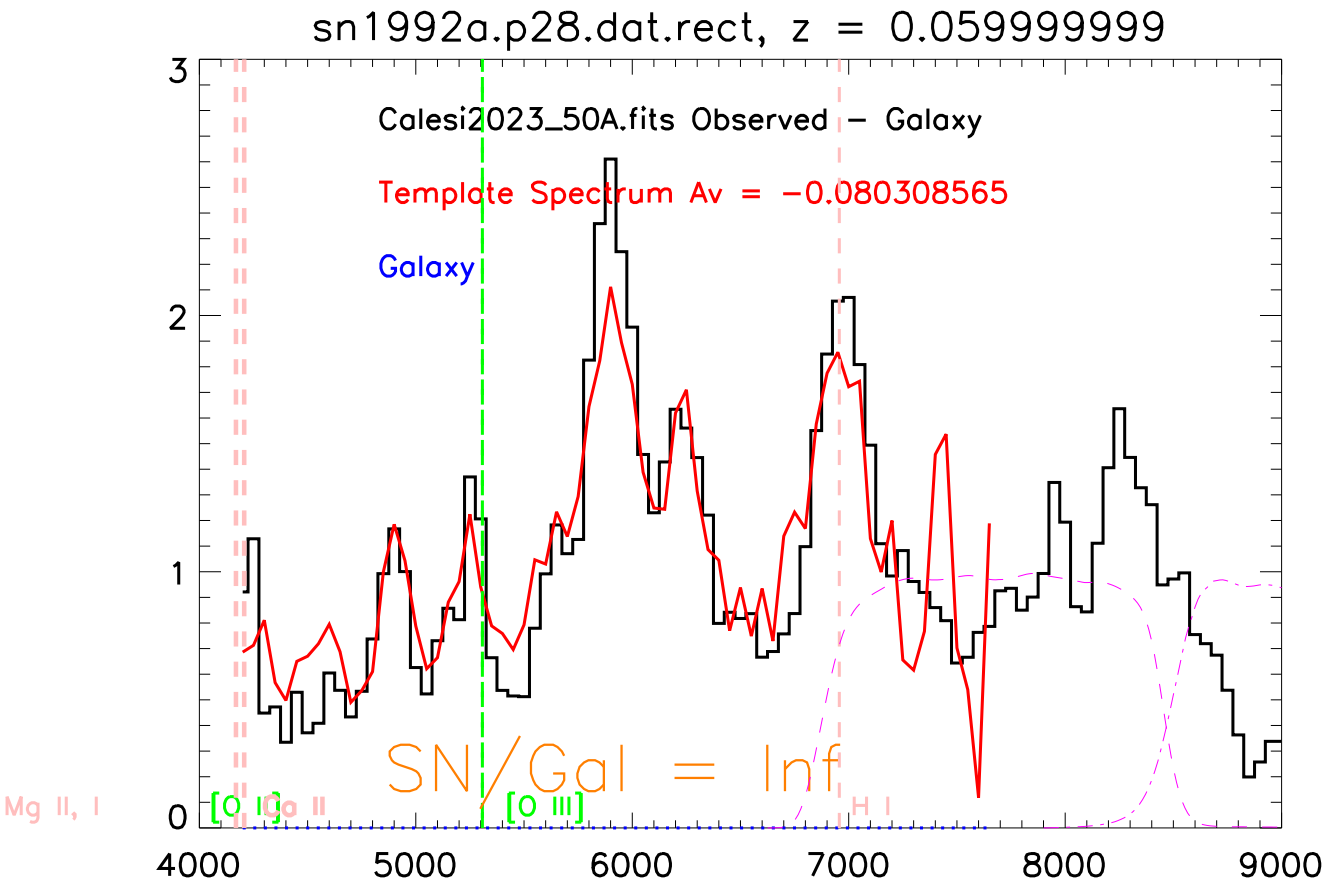
sn1992a.p28.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = −0.080308565
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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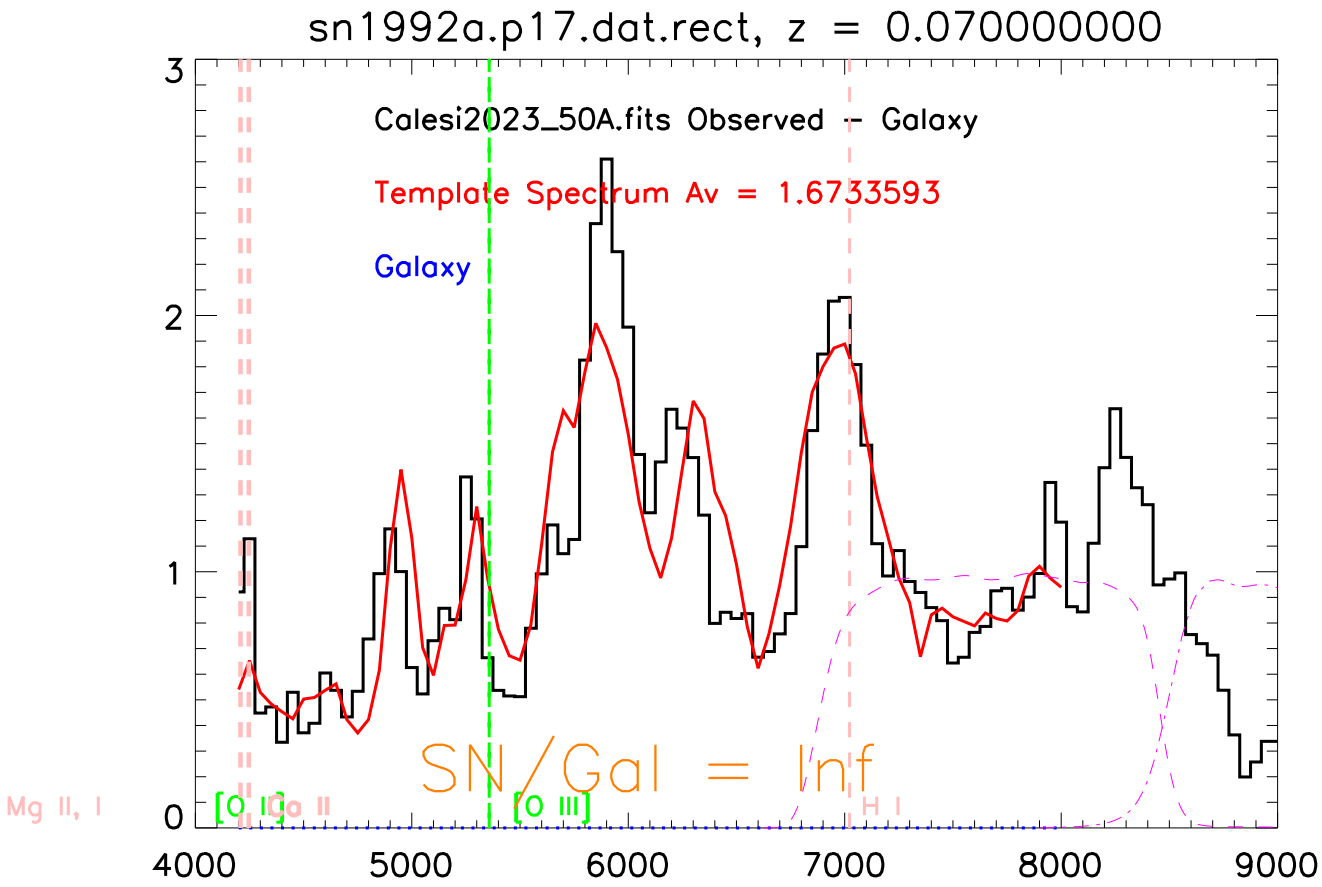
sn1992a.p17.dat.rect, z = 0.070000000
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Template Spectrum Av = 1.6733593
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SN/Gal = Inf
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[O III]
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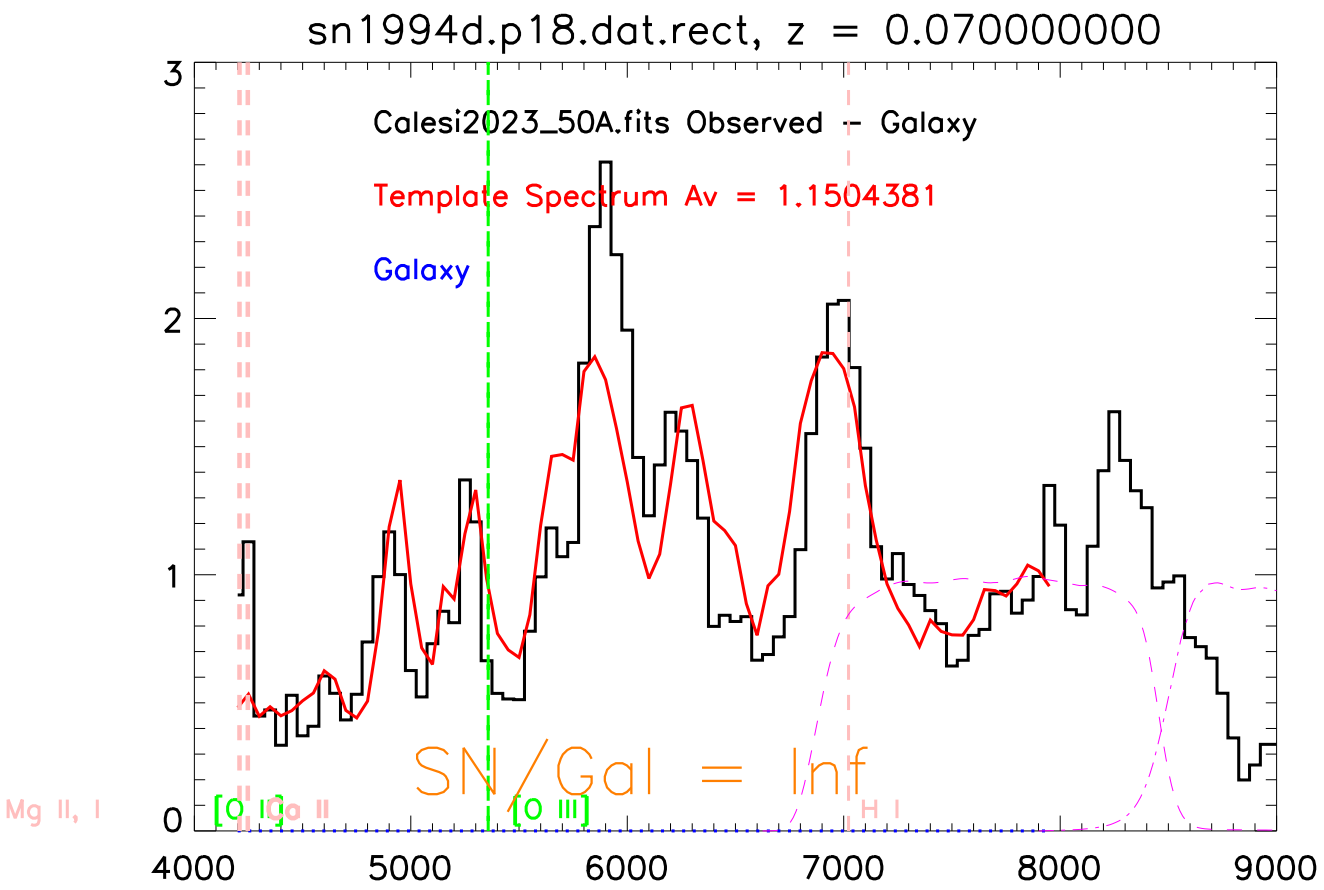
sn1994d.p18.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.1504381
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SN/Gal = Inf
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Ca II
[O III]
H I
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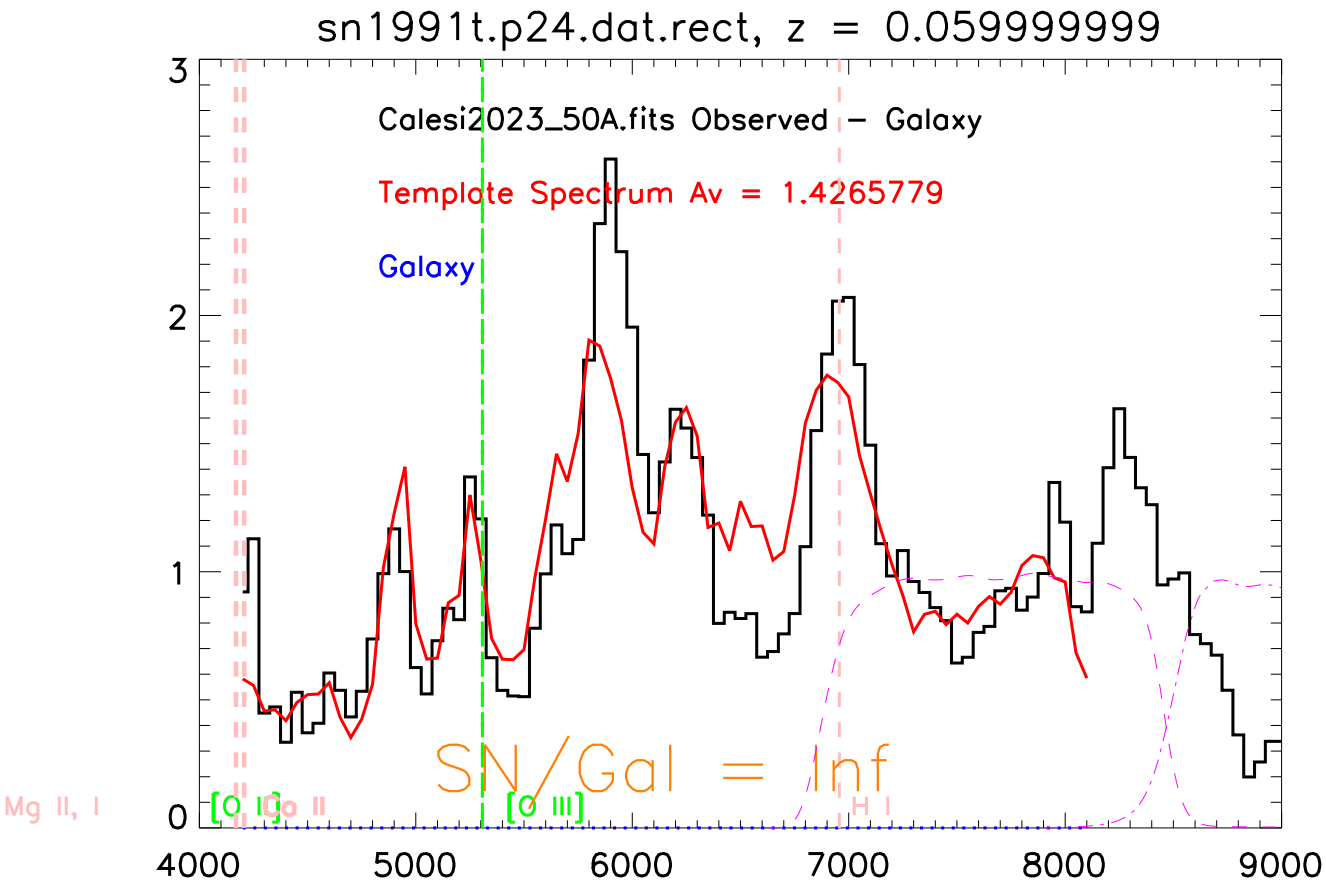
sn1991t.p24.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 1.4265779
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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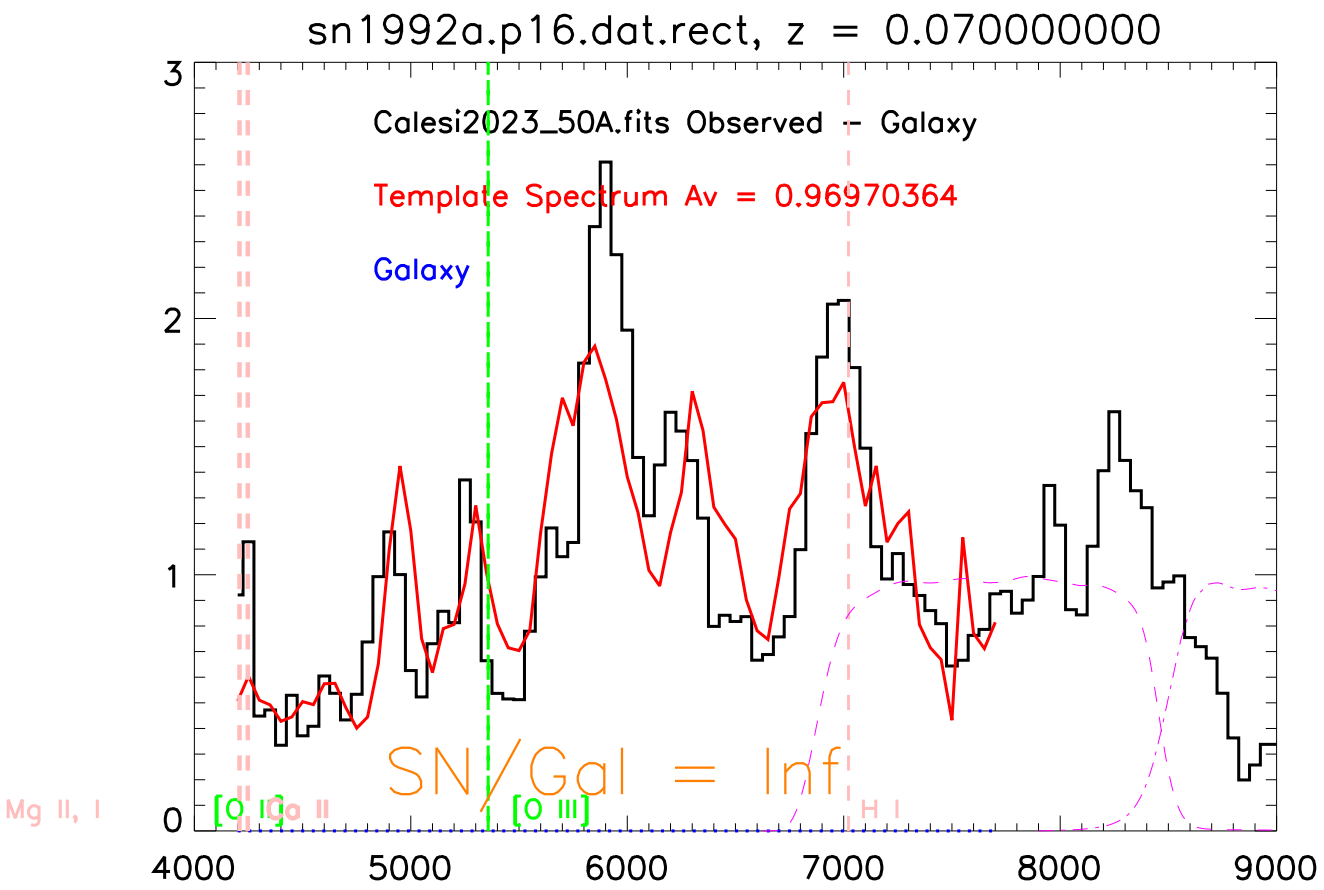
sn1992a.p16.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 0.96970364
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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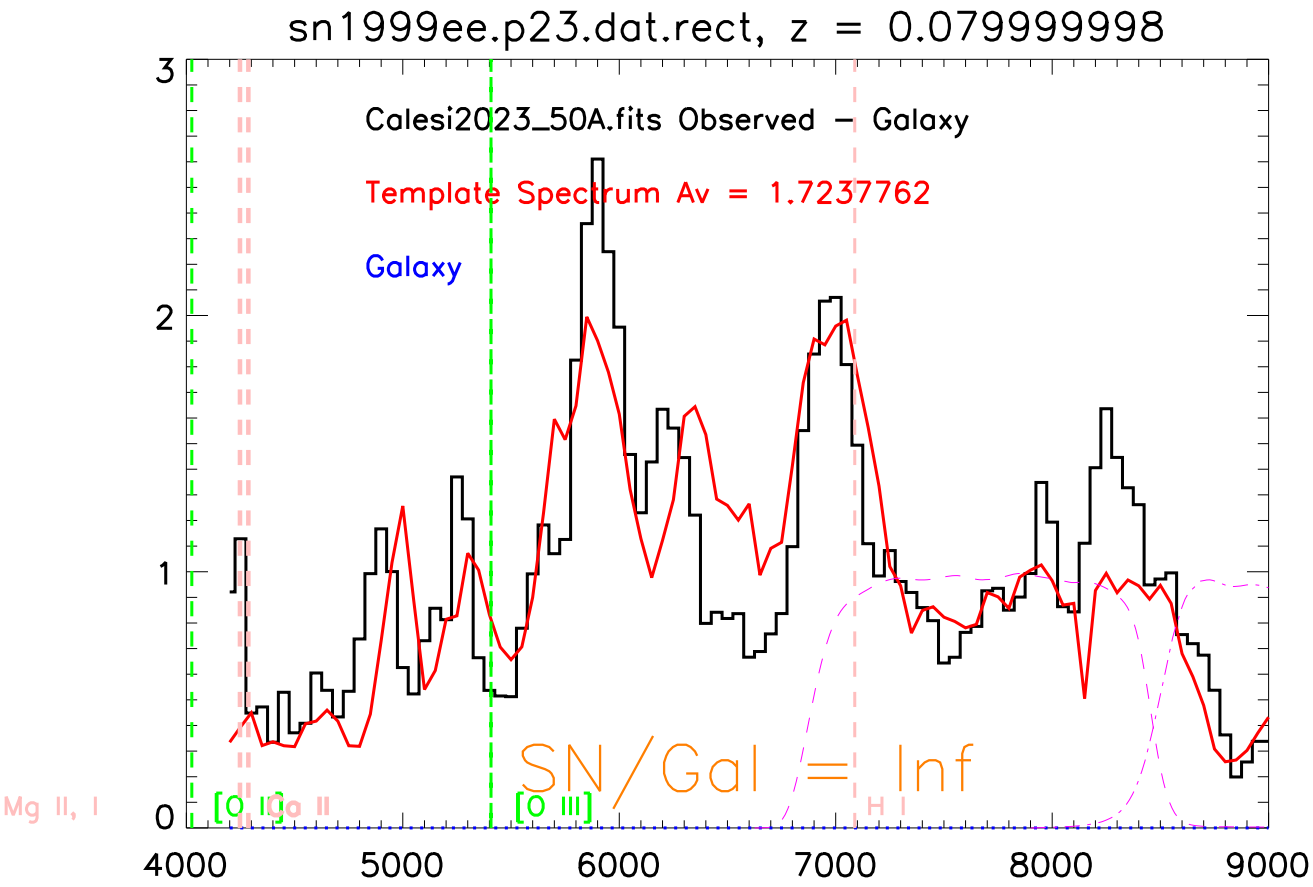
sn1999ee.p23.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 1.7237762
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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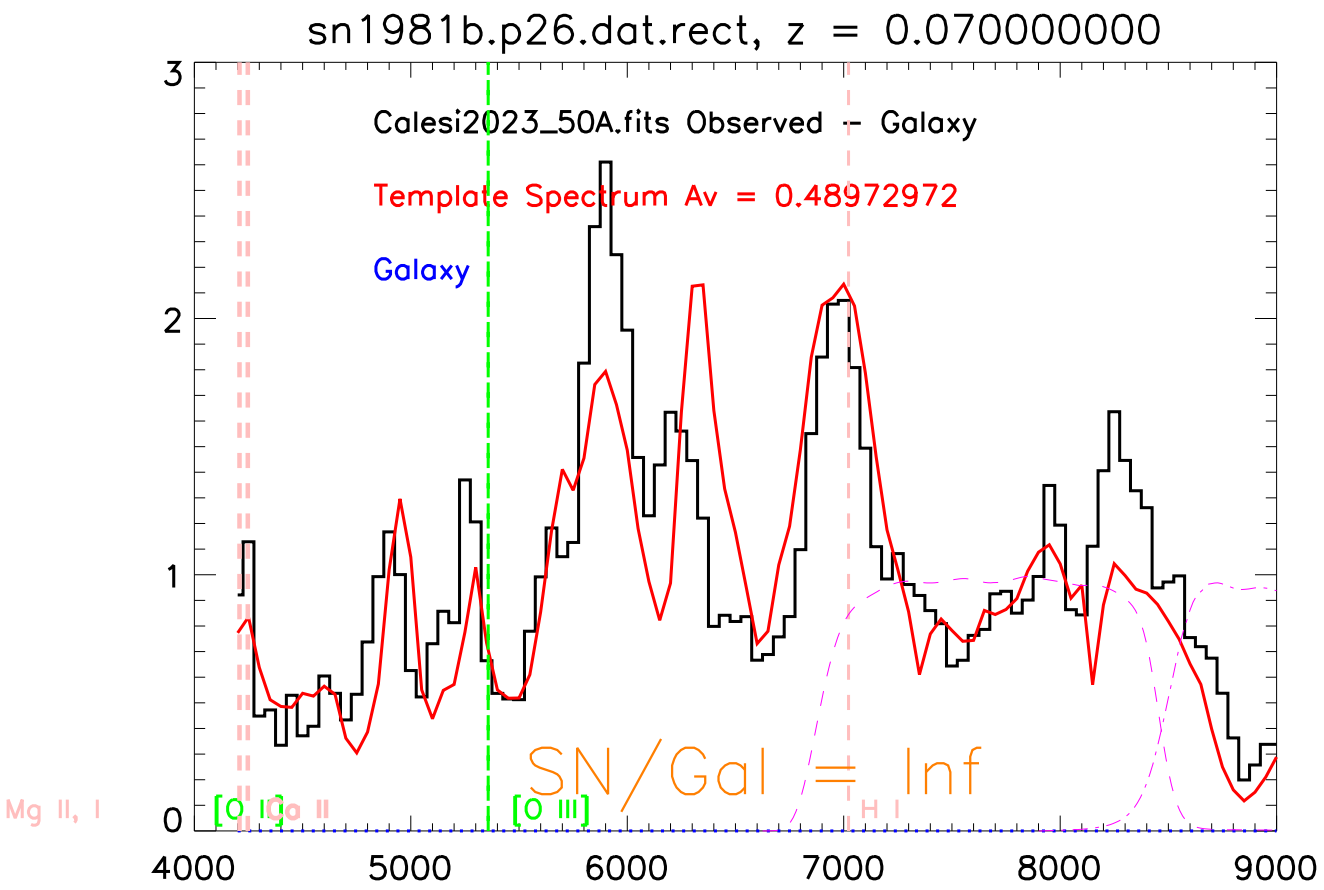
sn1981b.p26.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 0.48972972
Galaxy
SN/Gal = Inf
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[O III]
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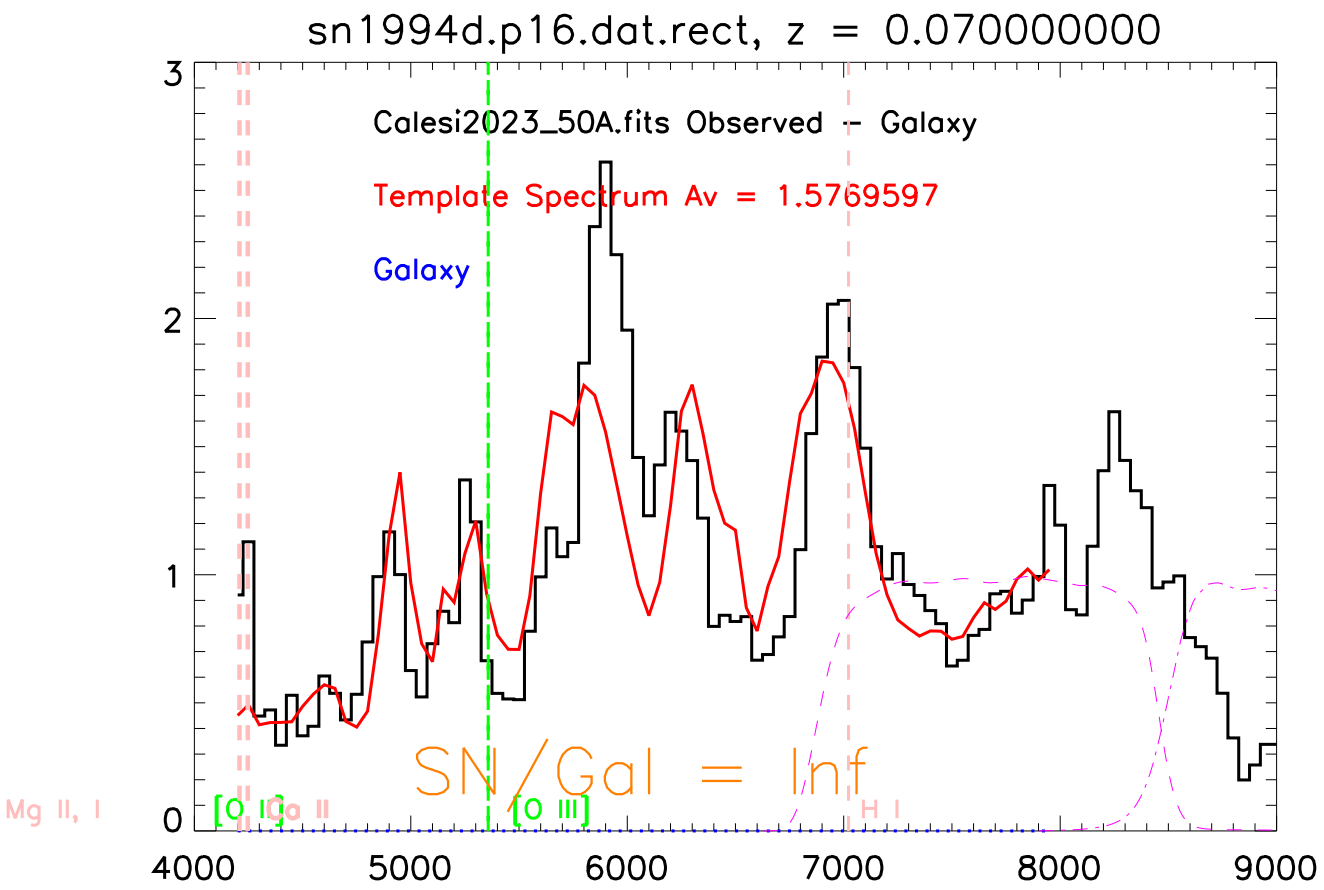
sn1994d.p16.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.5769597
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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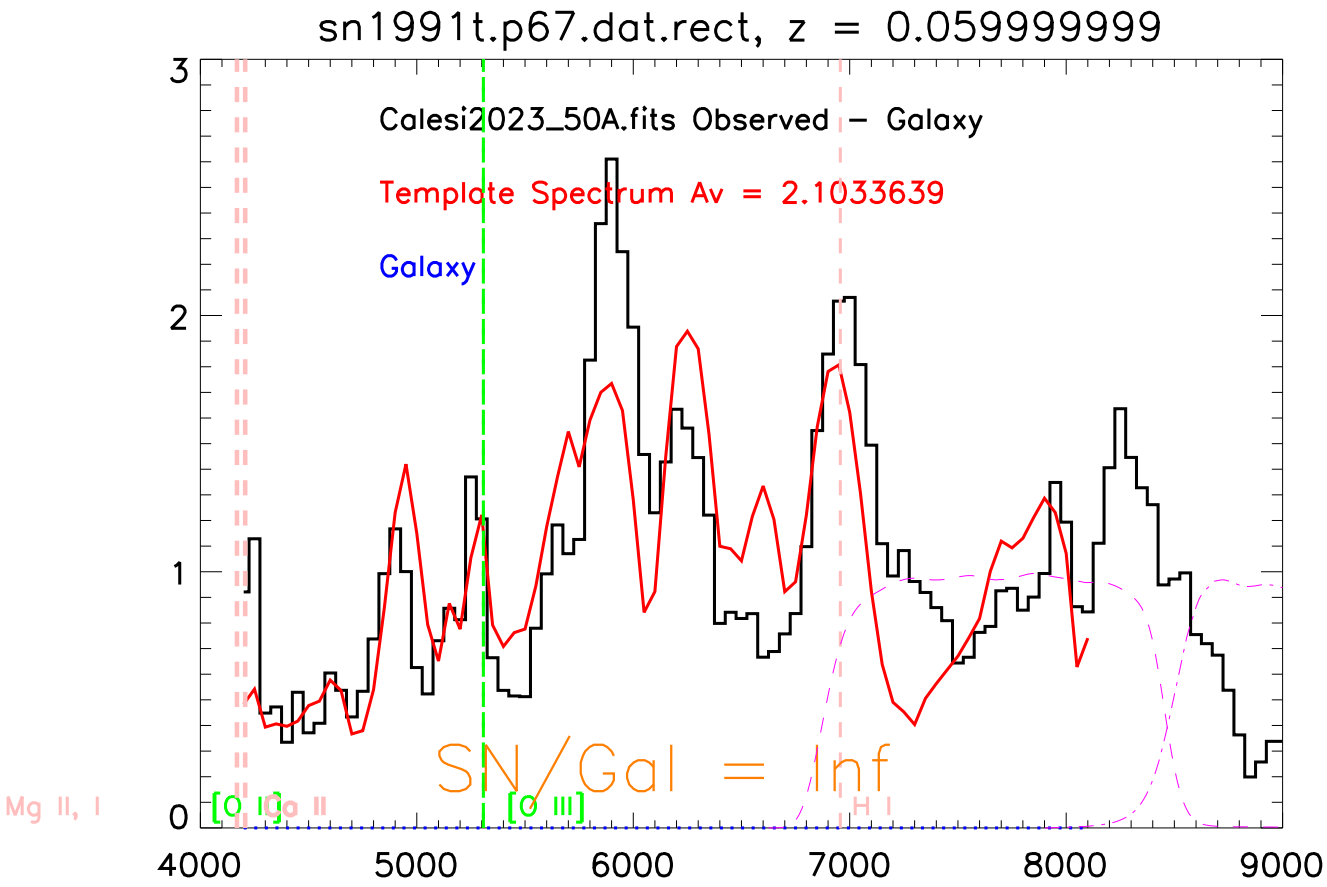
sn1991t.p67.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.1033639
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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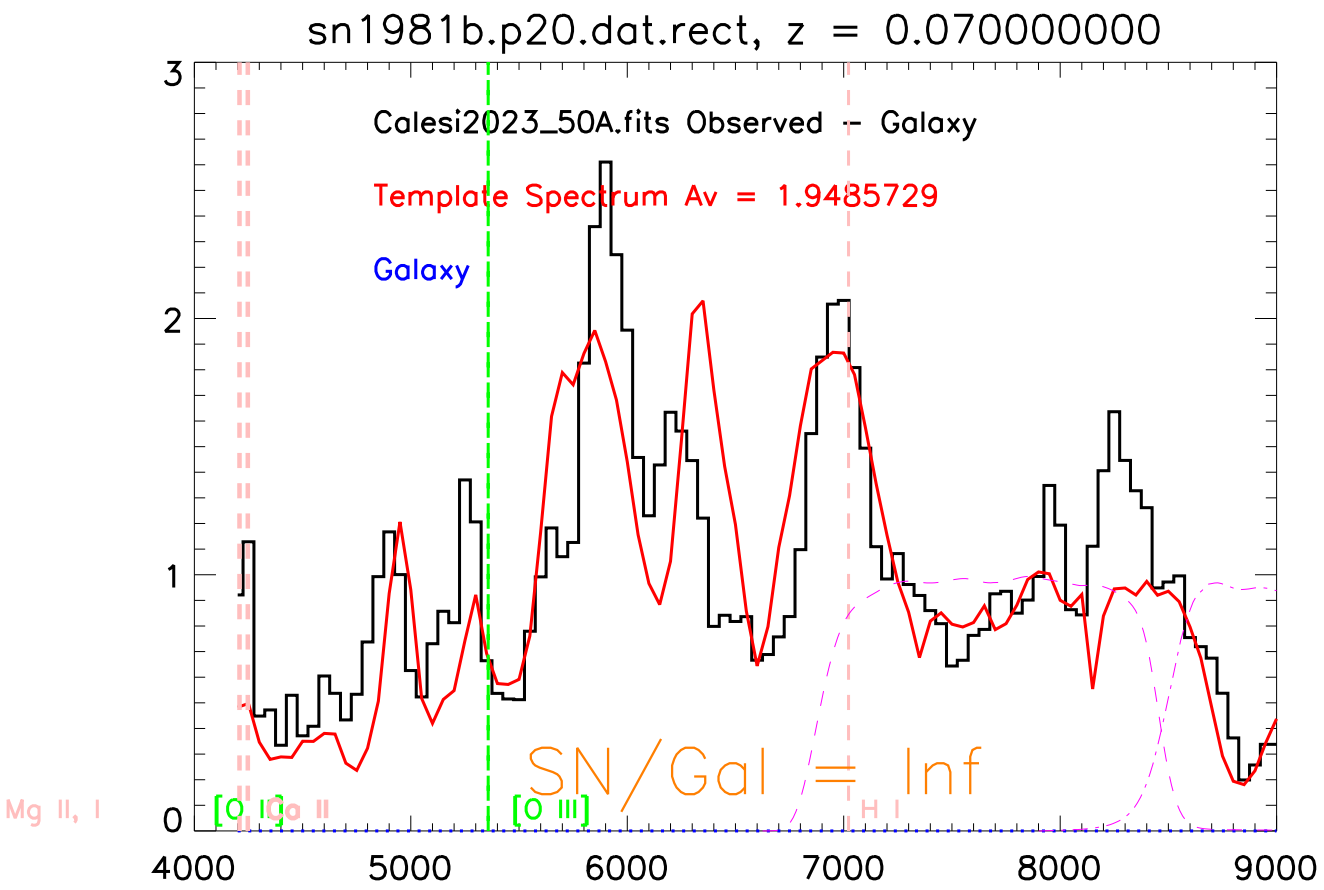
sn1981b.p20.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.9485729
Galaxy
SN/Gal = Inf
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[O III]
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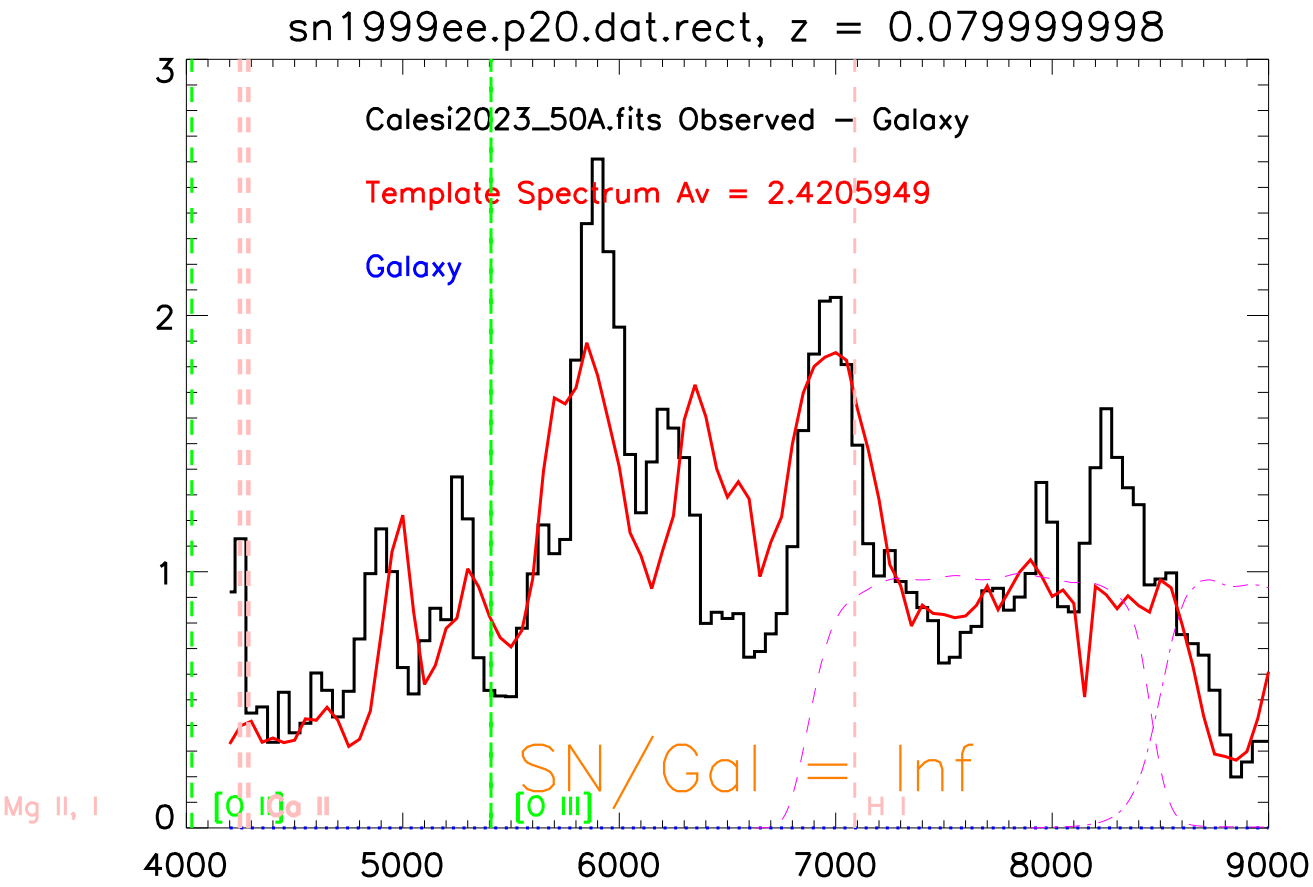
sn1999ee.p20.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.4205949
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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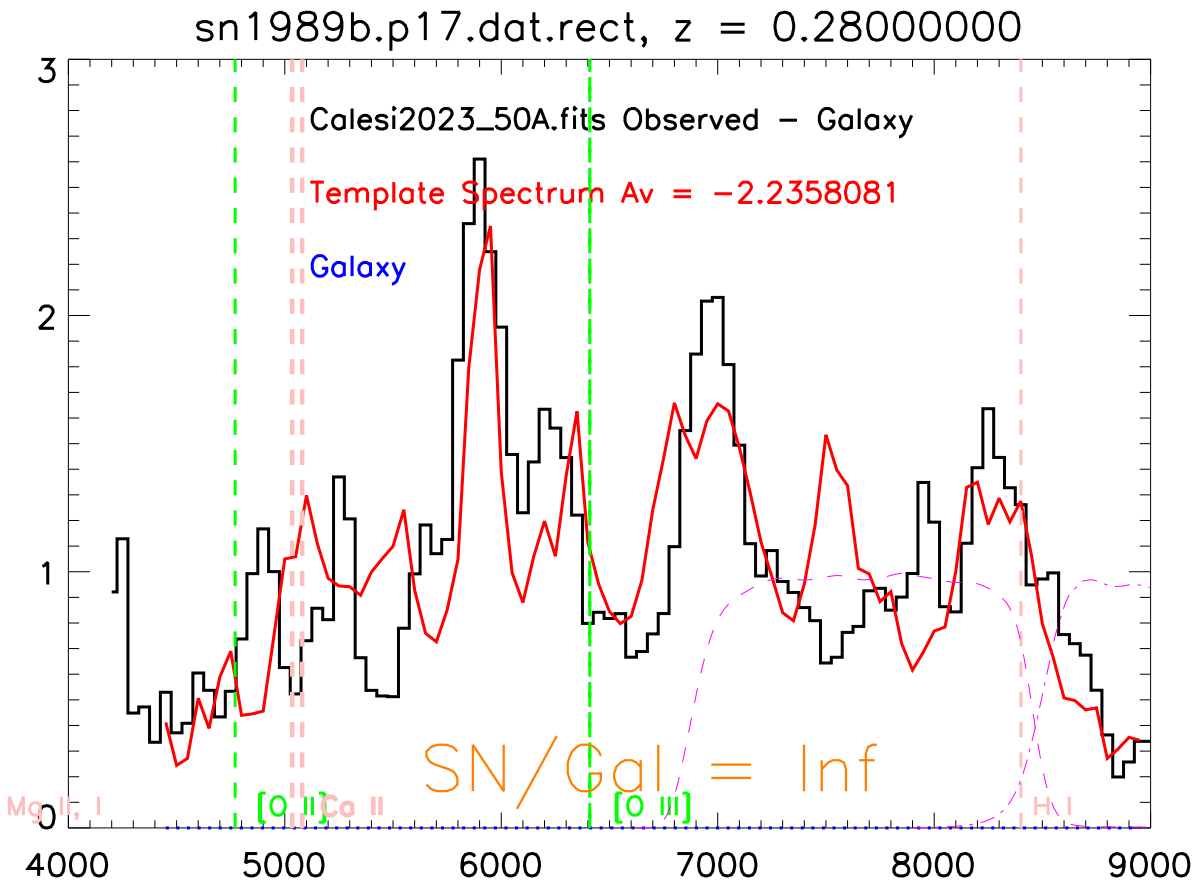
sn1989b.p17.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −2.2358081
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SN/Gal = Inf
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Ca II
[O III]
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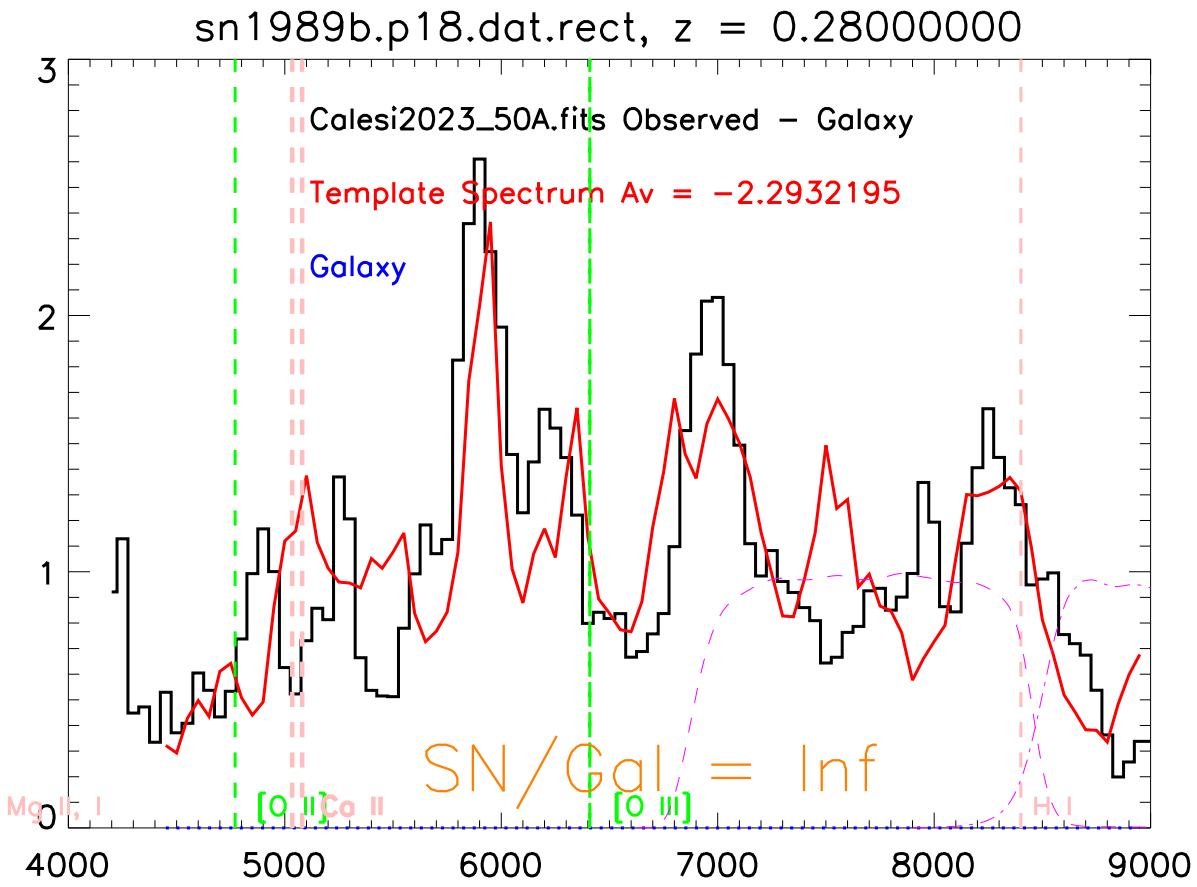
sn1989b.p18.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −2.2932195
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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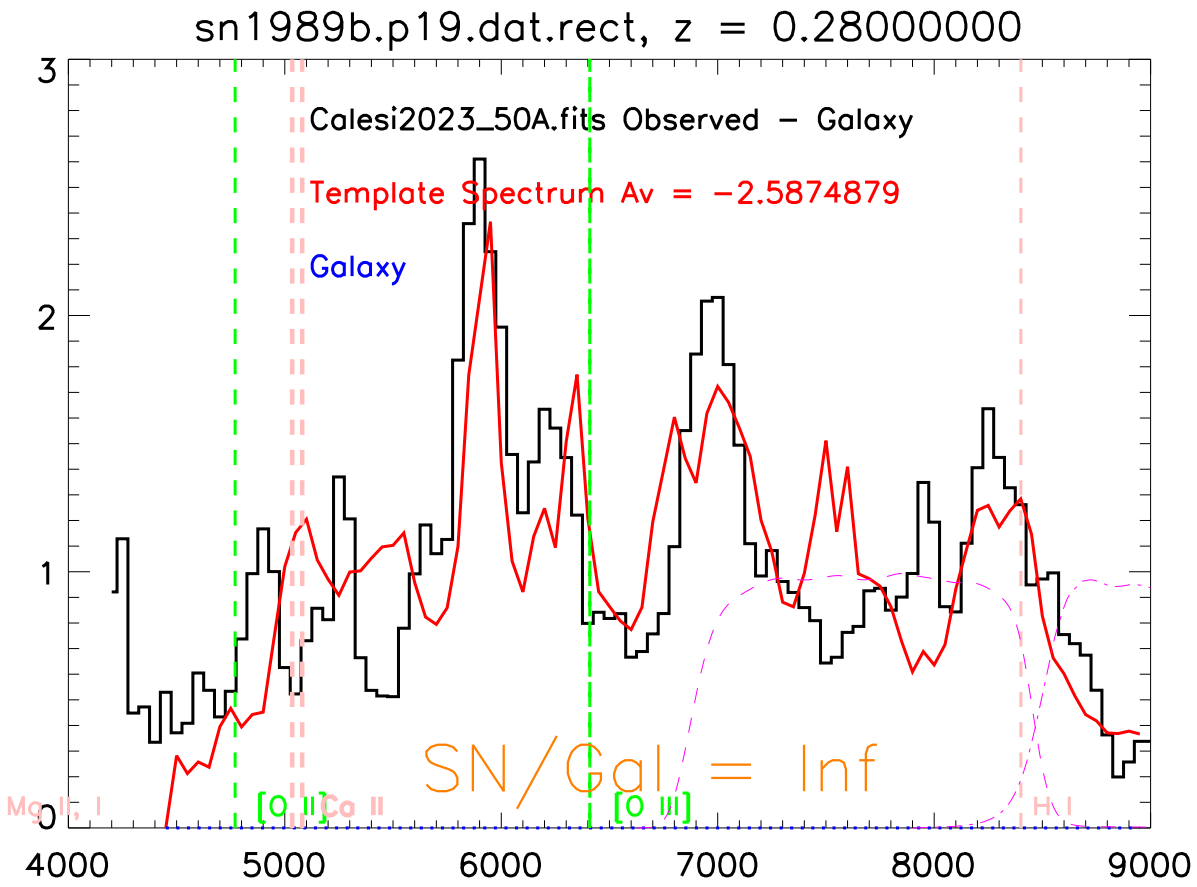
sn1989b.p19.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −2.5874879
Galaxy
SN/Gal = Inf
[O II]
Ca II
[O III]
H I
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0
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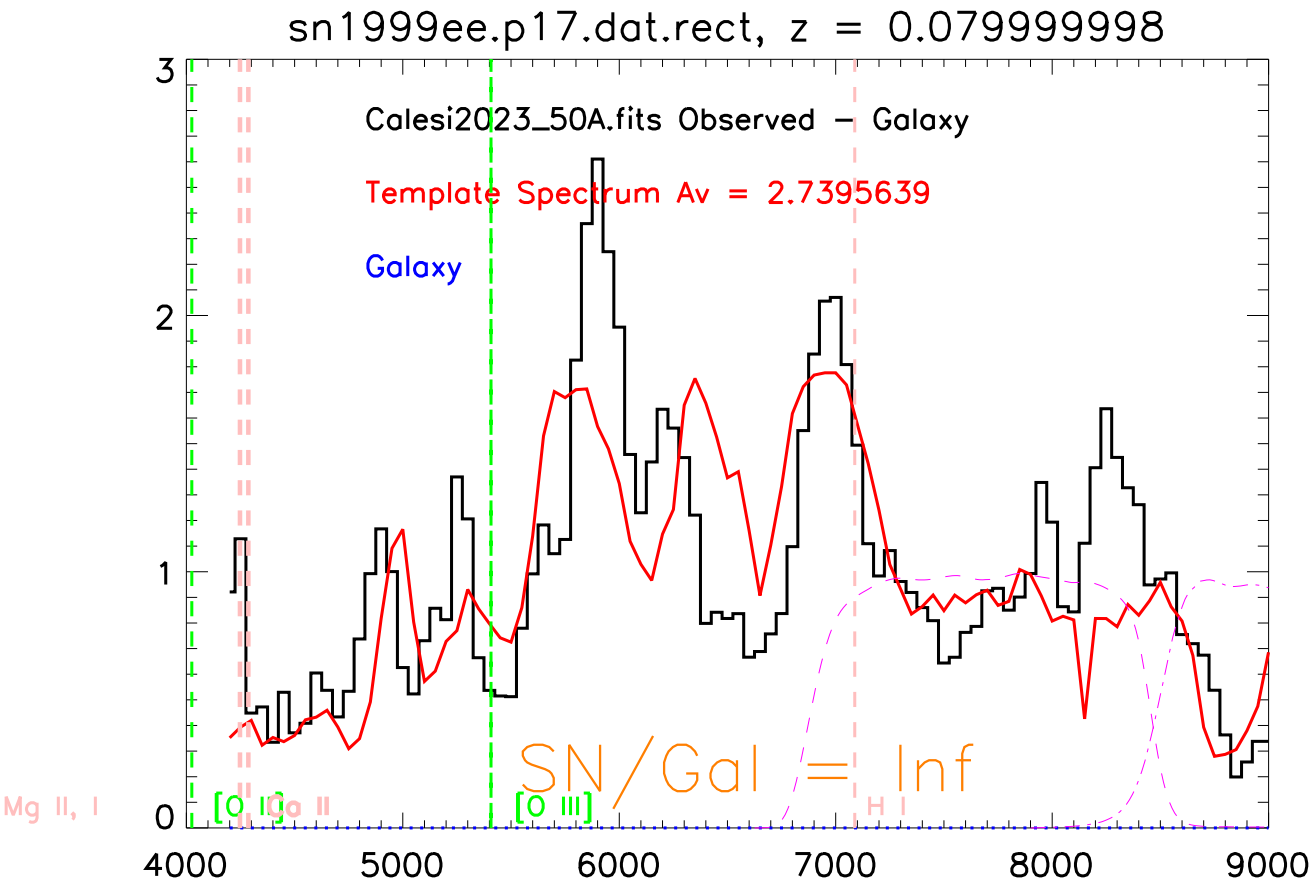
7000
8000
9000


sn1999ee.p17.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.7395639
Galaxy
SN/Gal = Inf
Mg II, I
[O I]
Ca II
[O III]
H I
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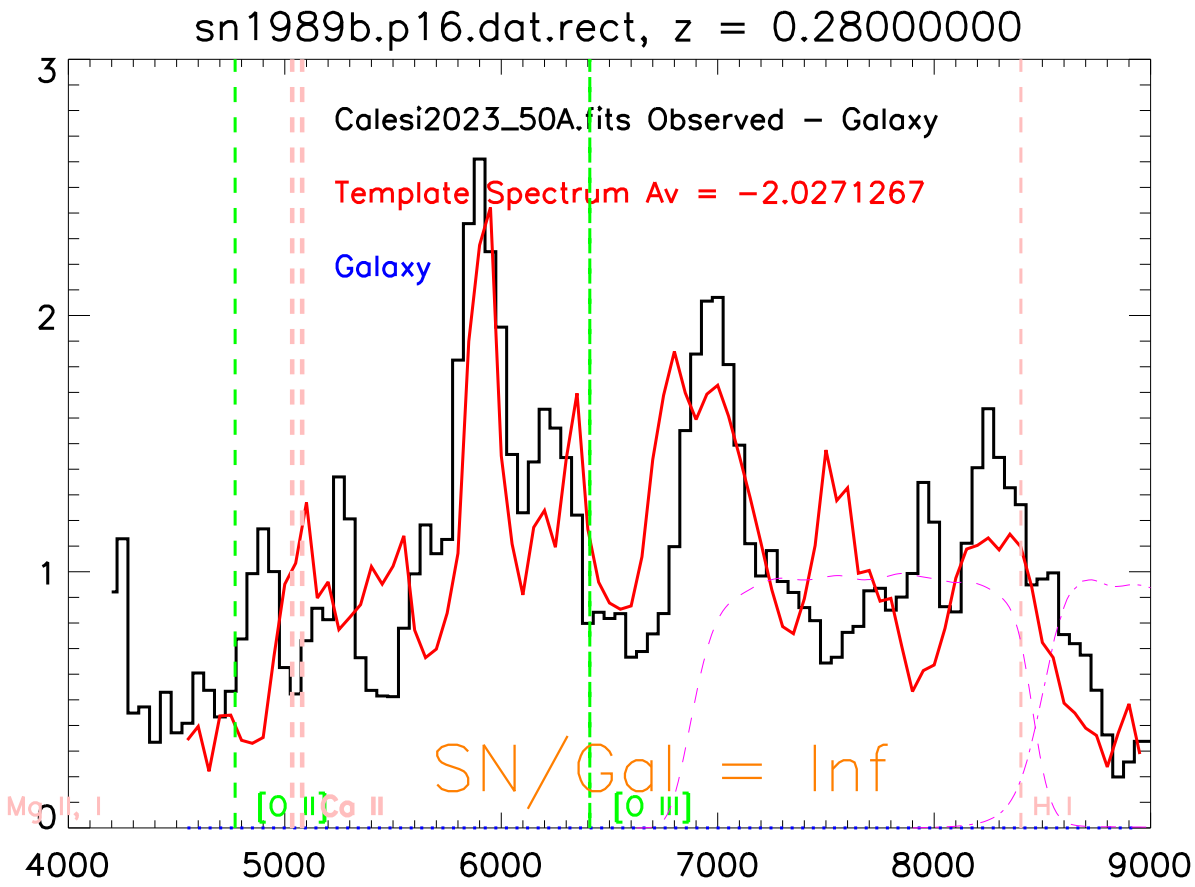
sn1989b.p16.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −2.0271267
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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7000
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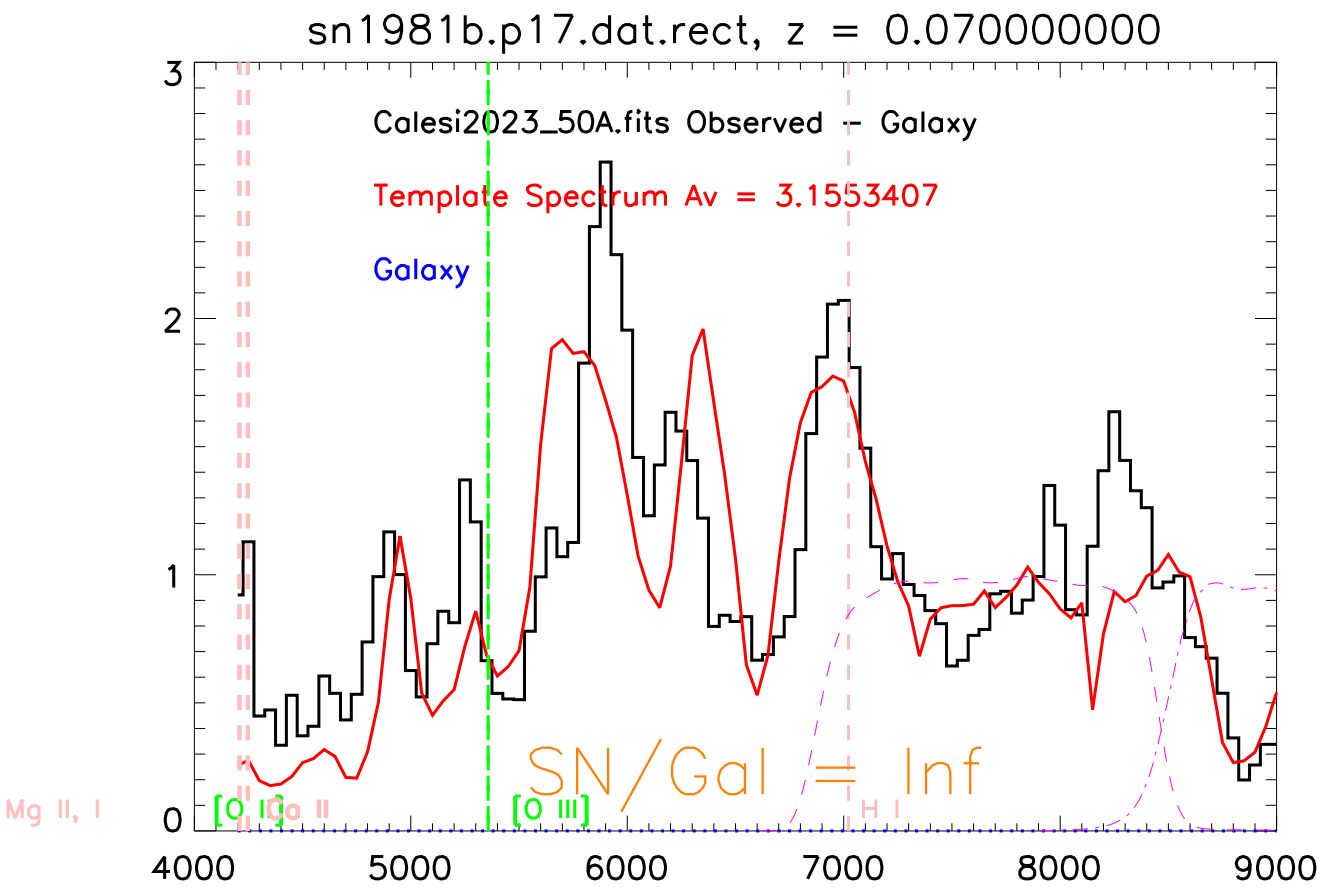
sn1981b.p17.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.1553407
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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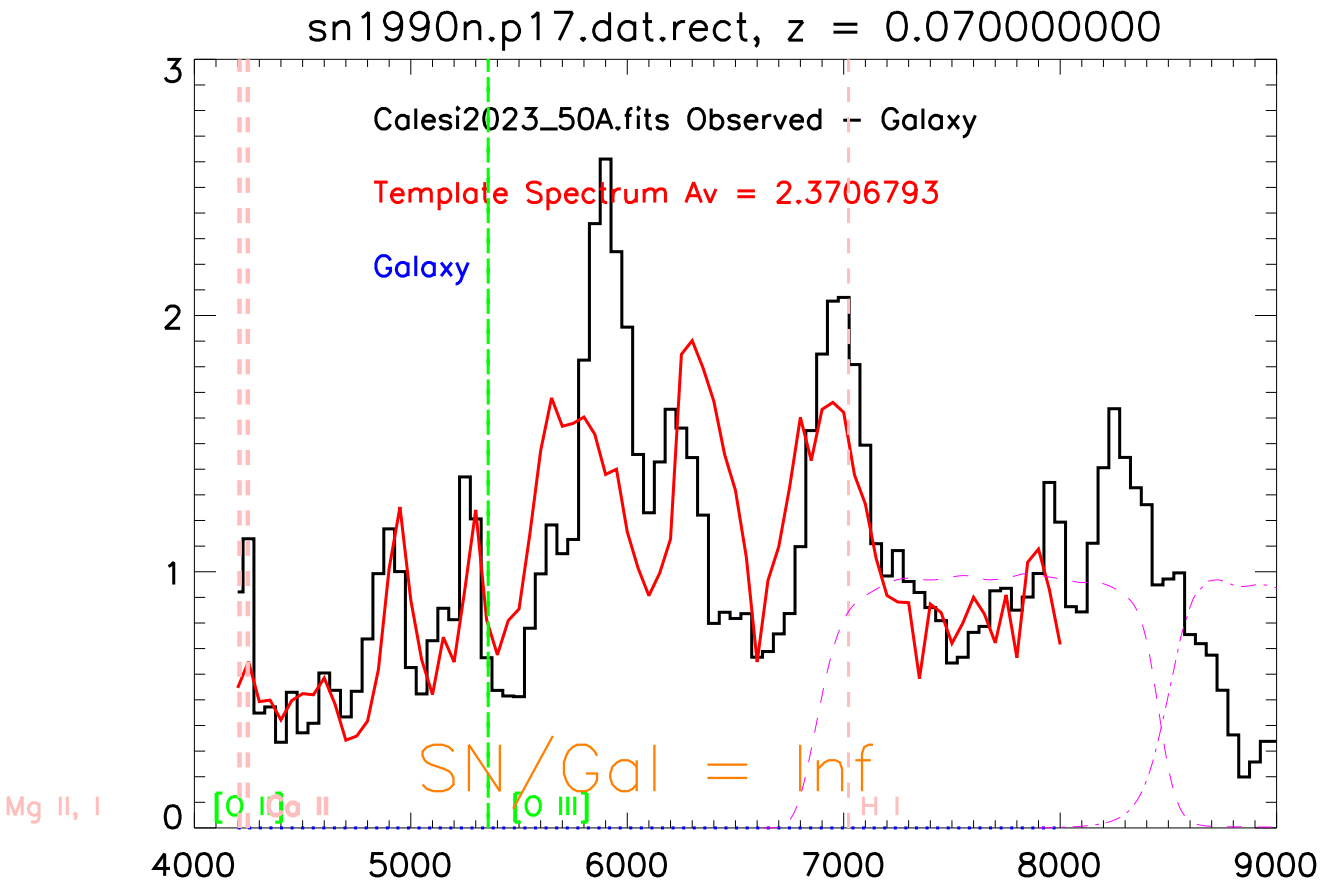
8000
9000


sn1990n.p17.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 2.3706793
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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0
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7000
8000
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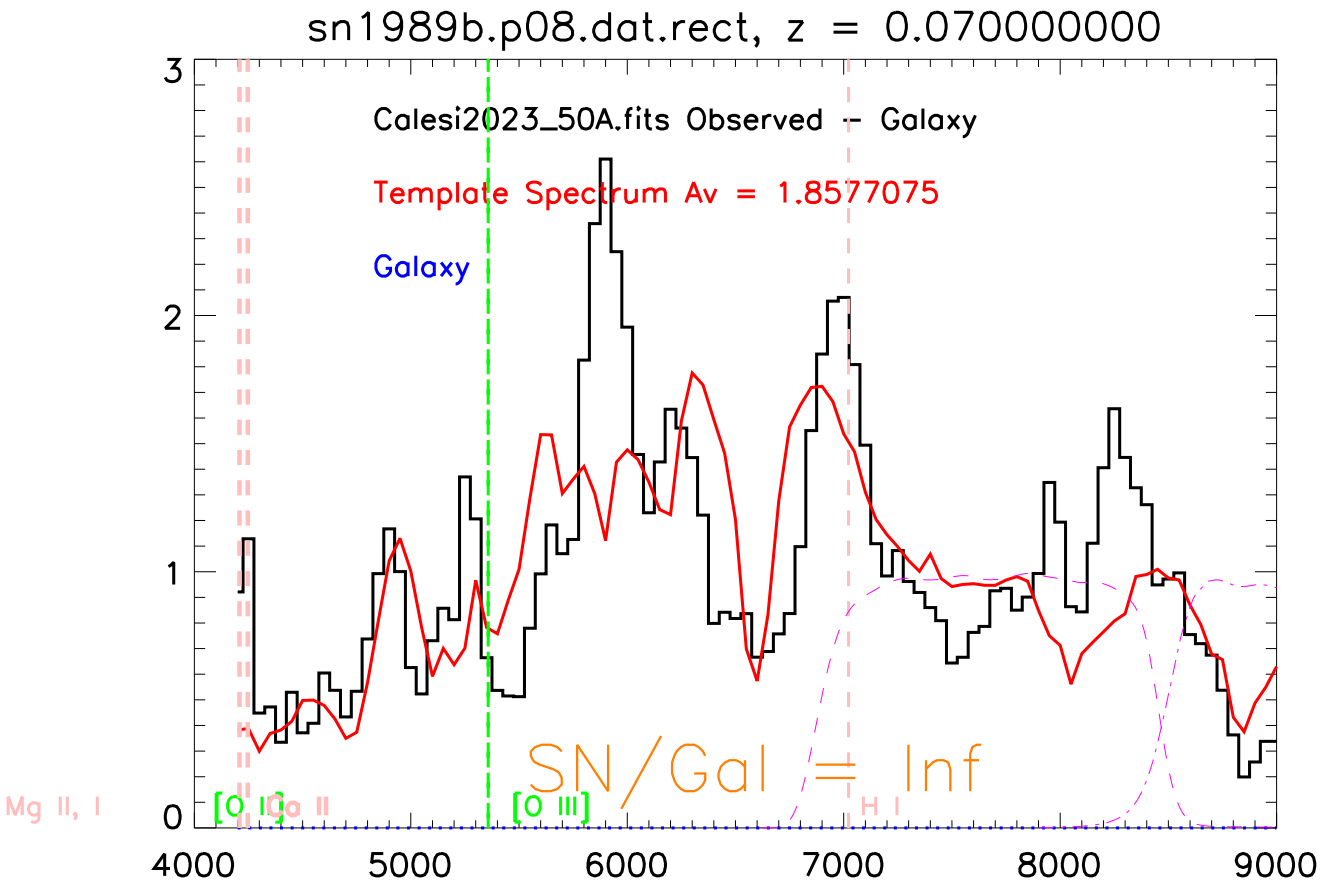
sn1989b.p08.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.8577075
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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3
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7000
8000
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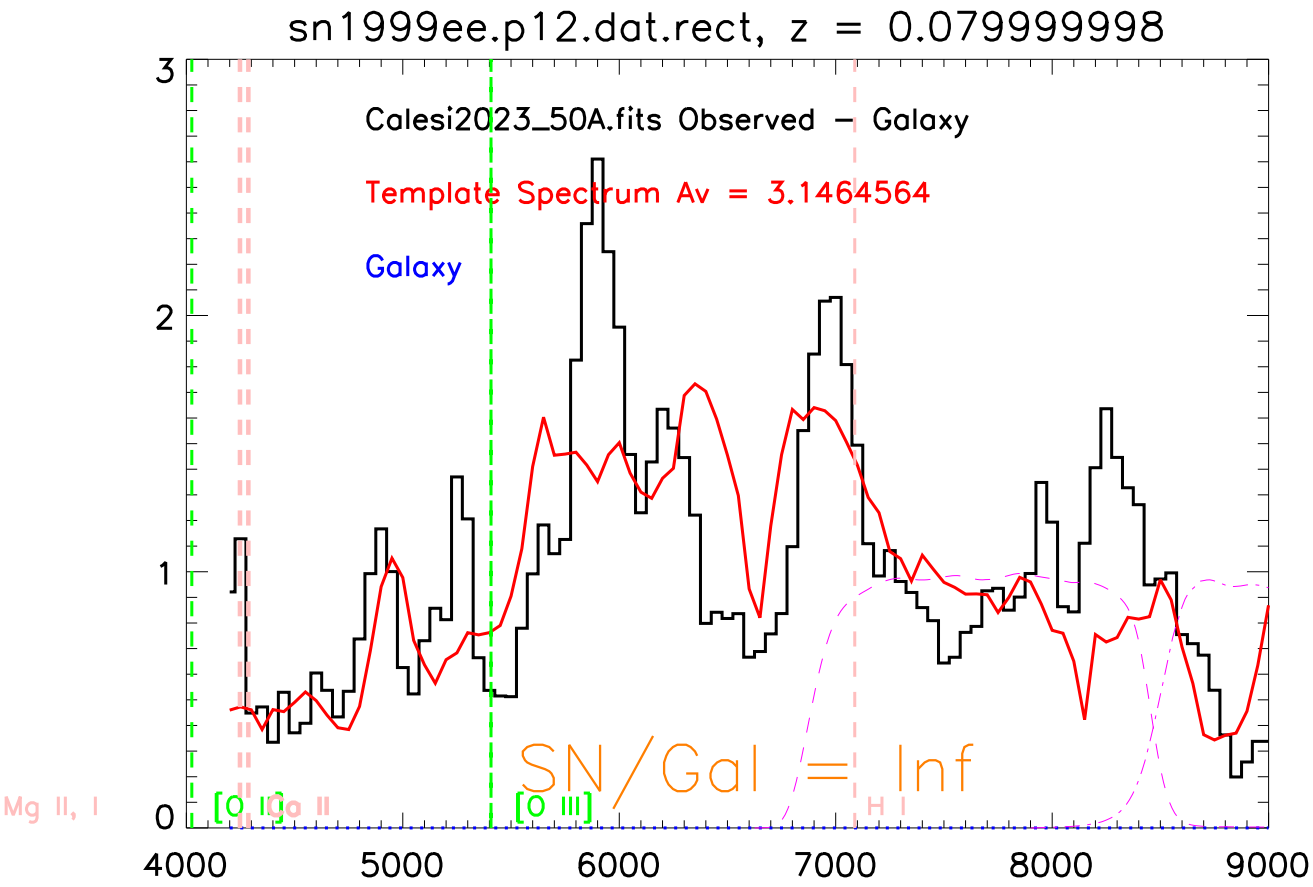
sn1999ee.p12.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.1464564
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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7000
8000
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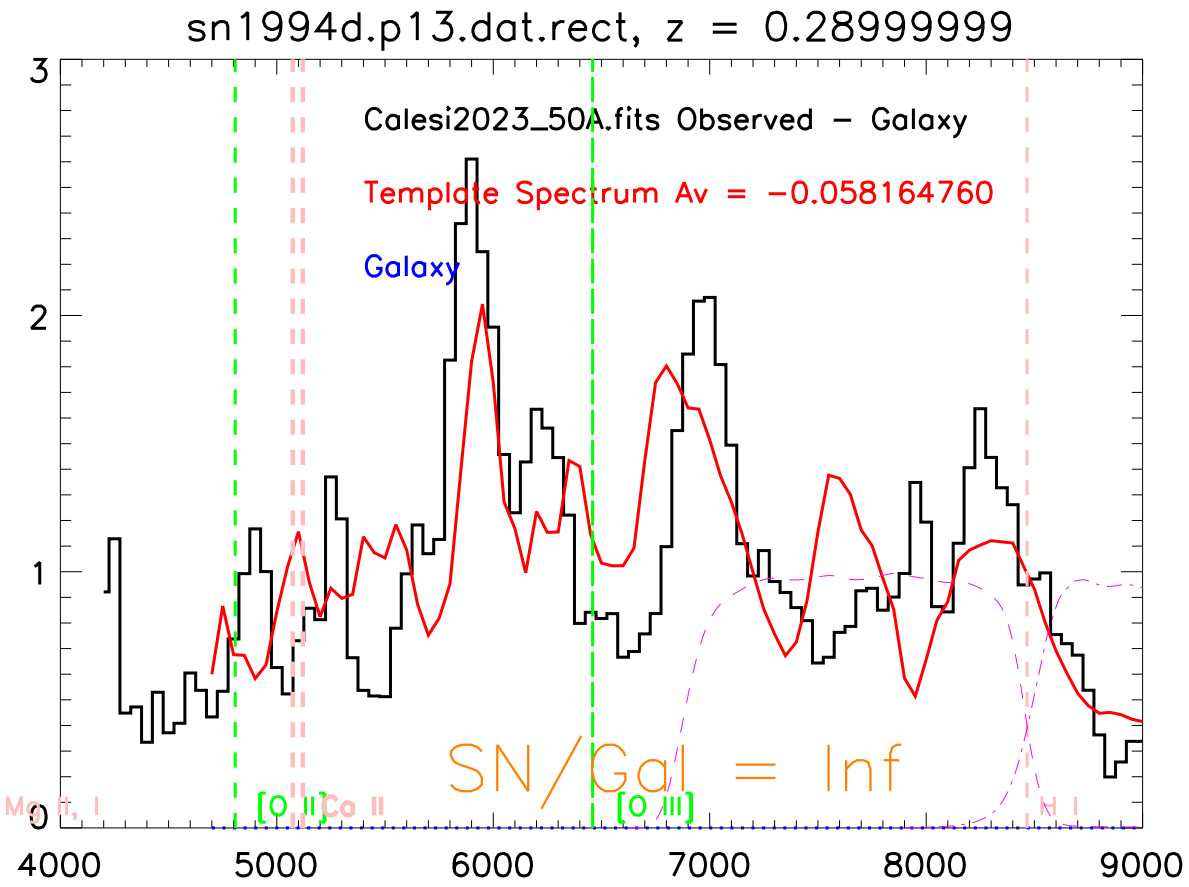
sn1994d.p13.dat.rect, z = 0.28999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −0.058164760
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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1
0
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7000
8000
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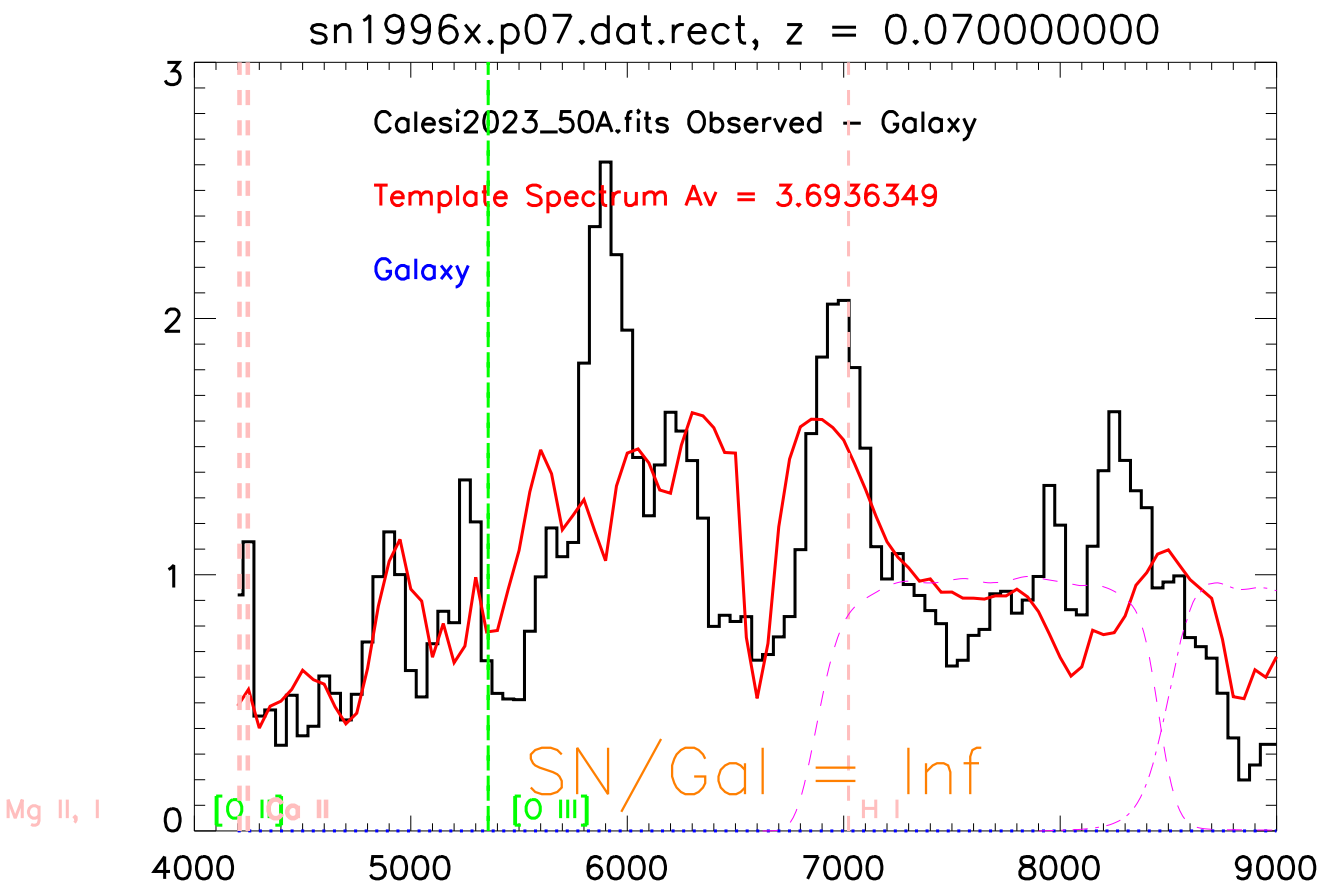
sn1996x.p07.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.6936349
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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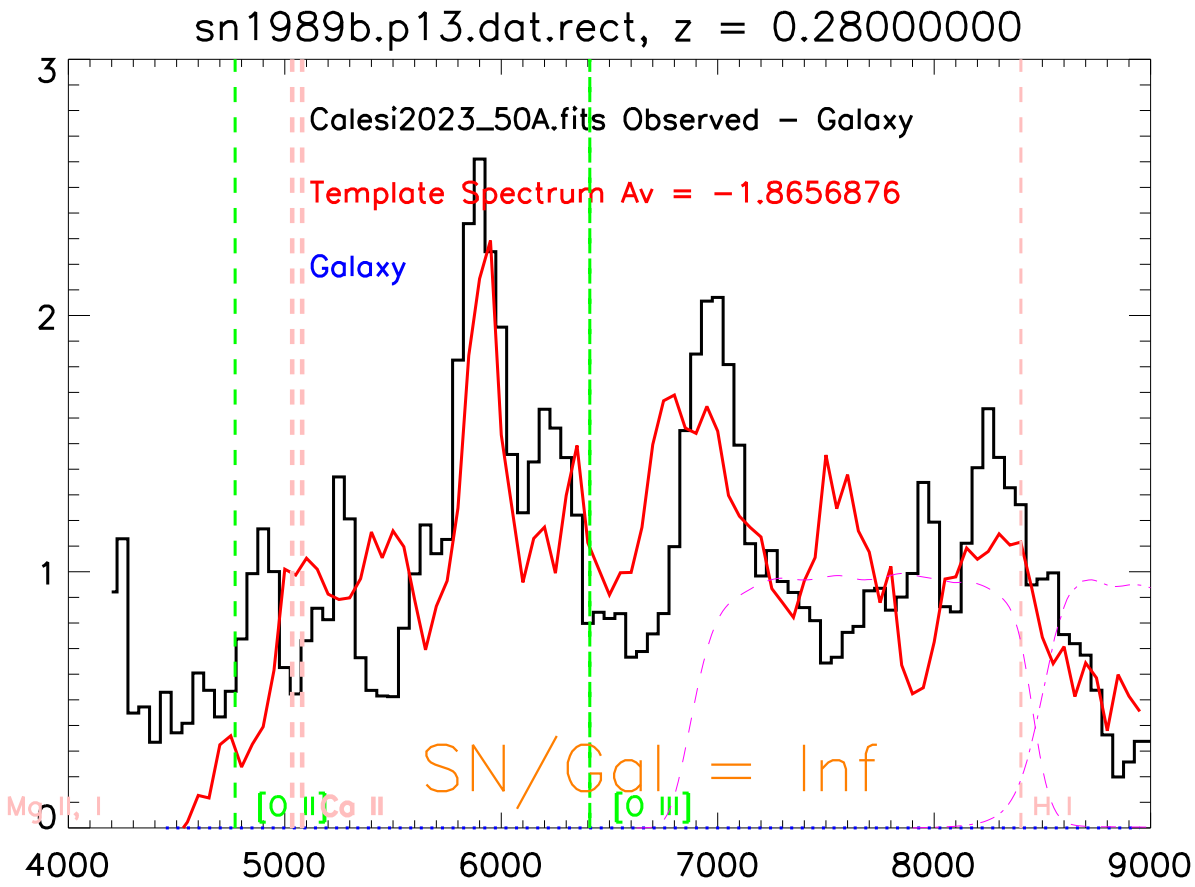
sn1989b.p13.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −1.8656876
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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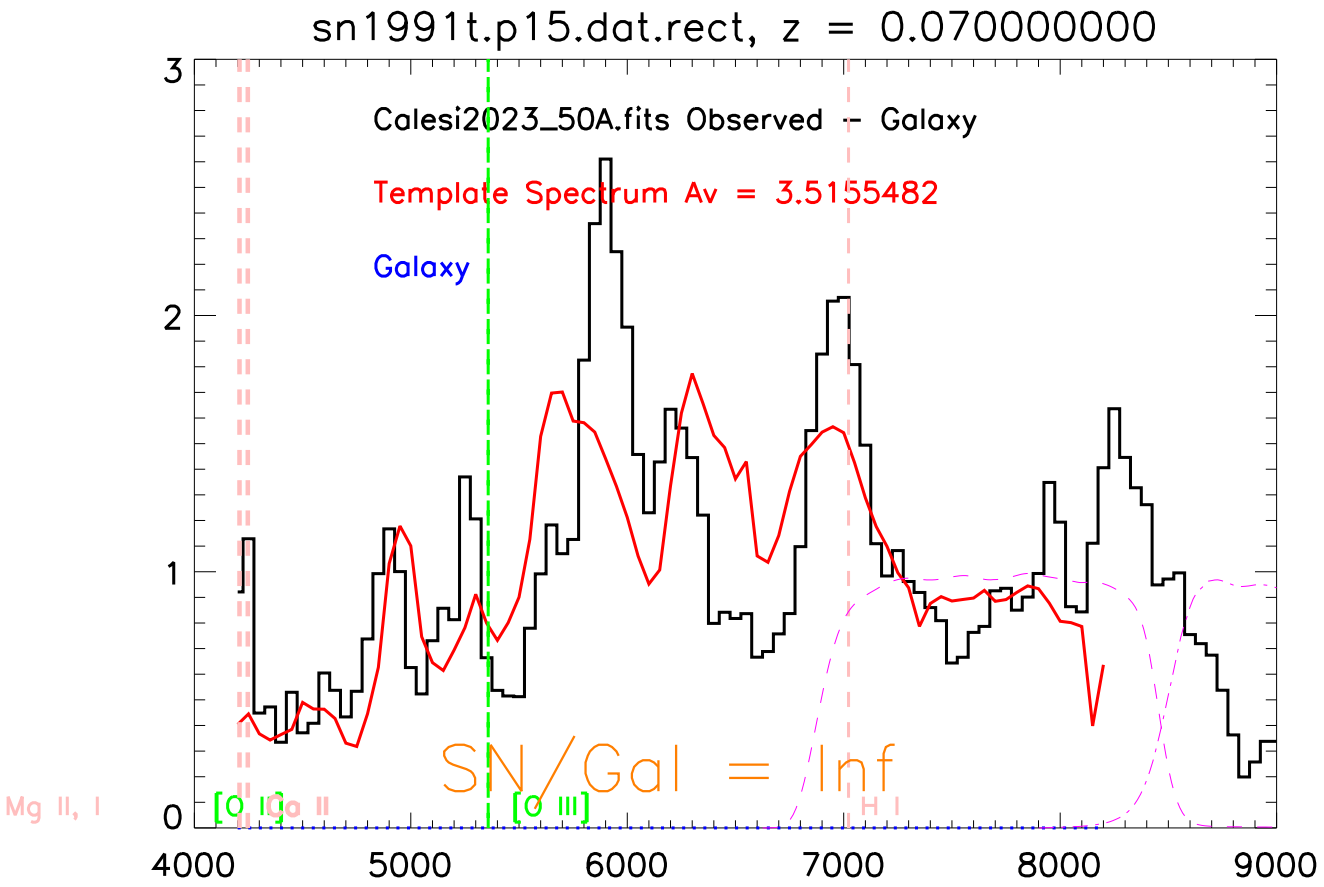
sn1991t.p15.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.5155482
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
0
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7000
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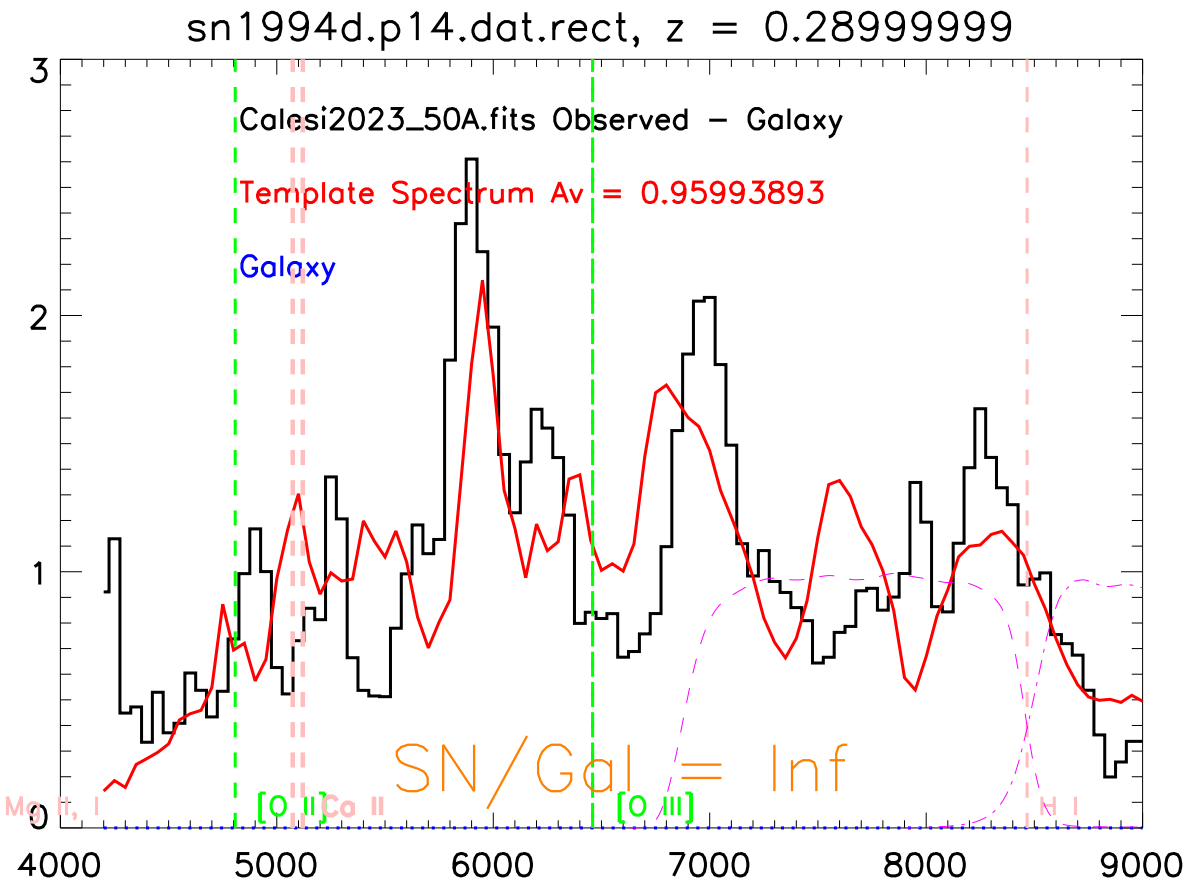
sn1994d.p14.dat.rect, z = 0.28999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 0.95993893
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
3
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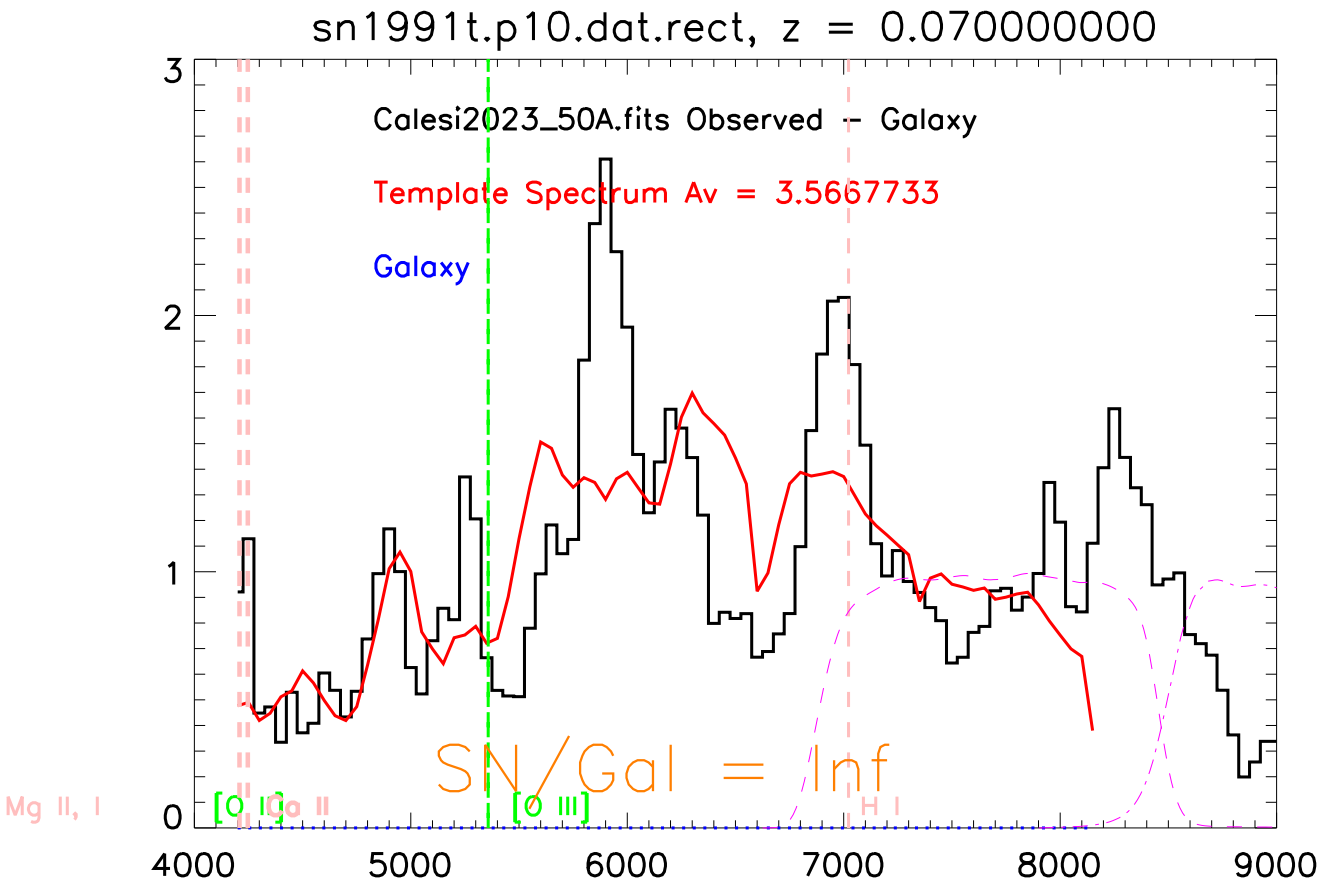
7000
8000
9000


sn1991t.p10.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.5667733
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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4000
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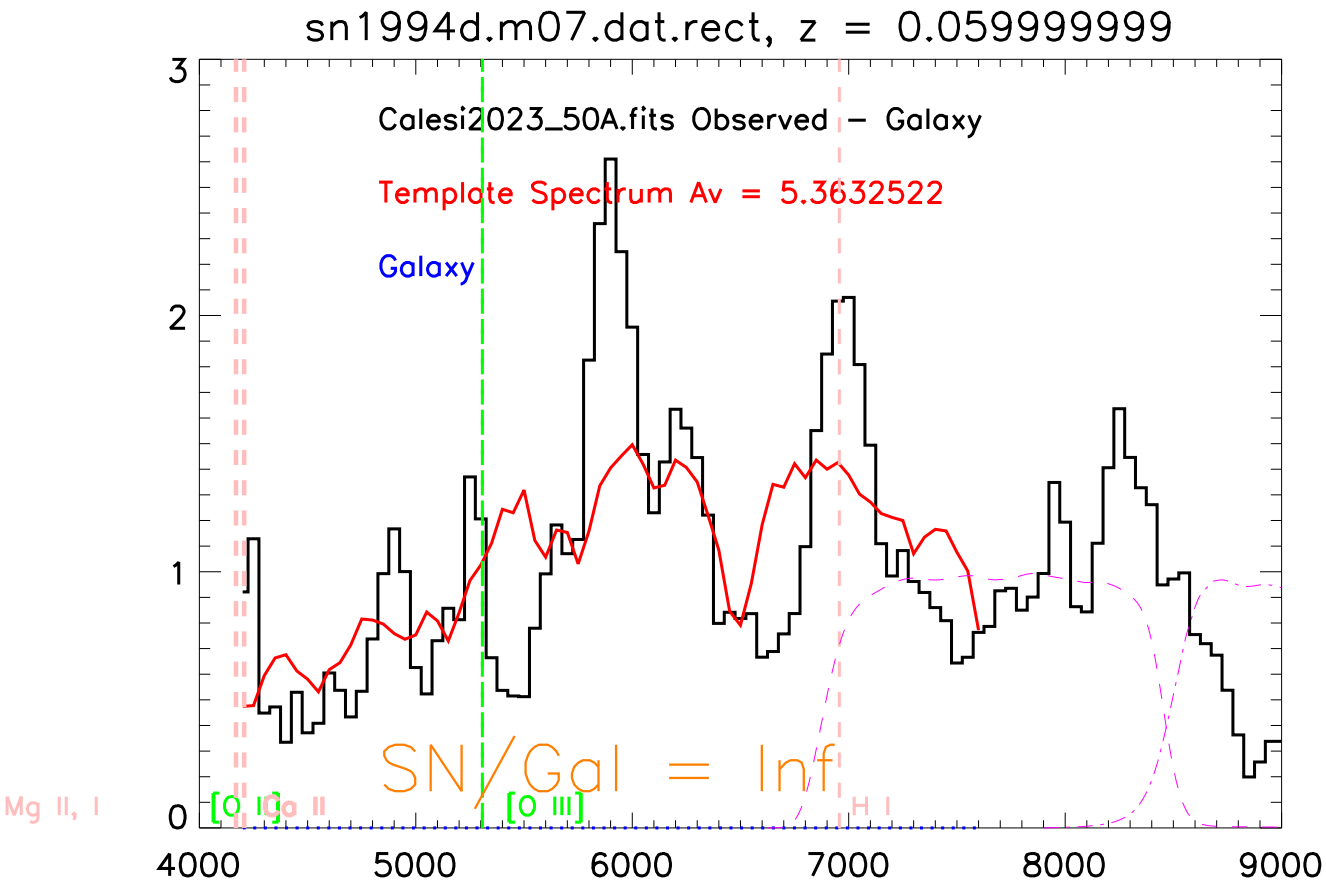
7000
8000
9000


sn1994d.m07.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 5.3632522
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
0
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4000
5000
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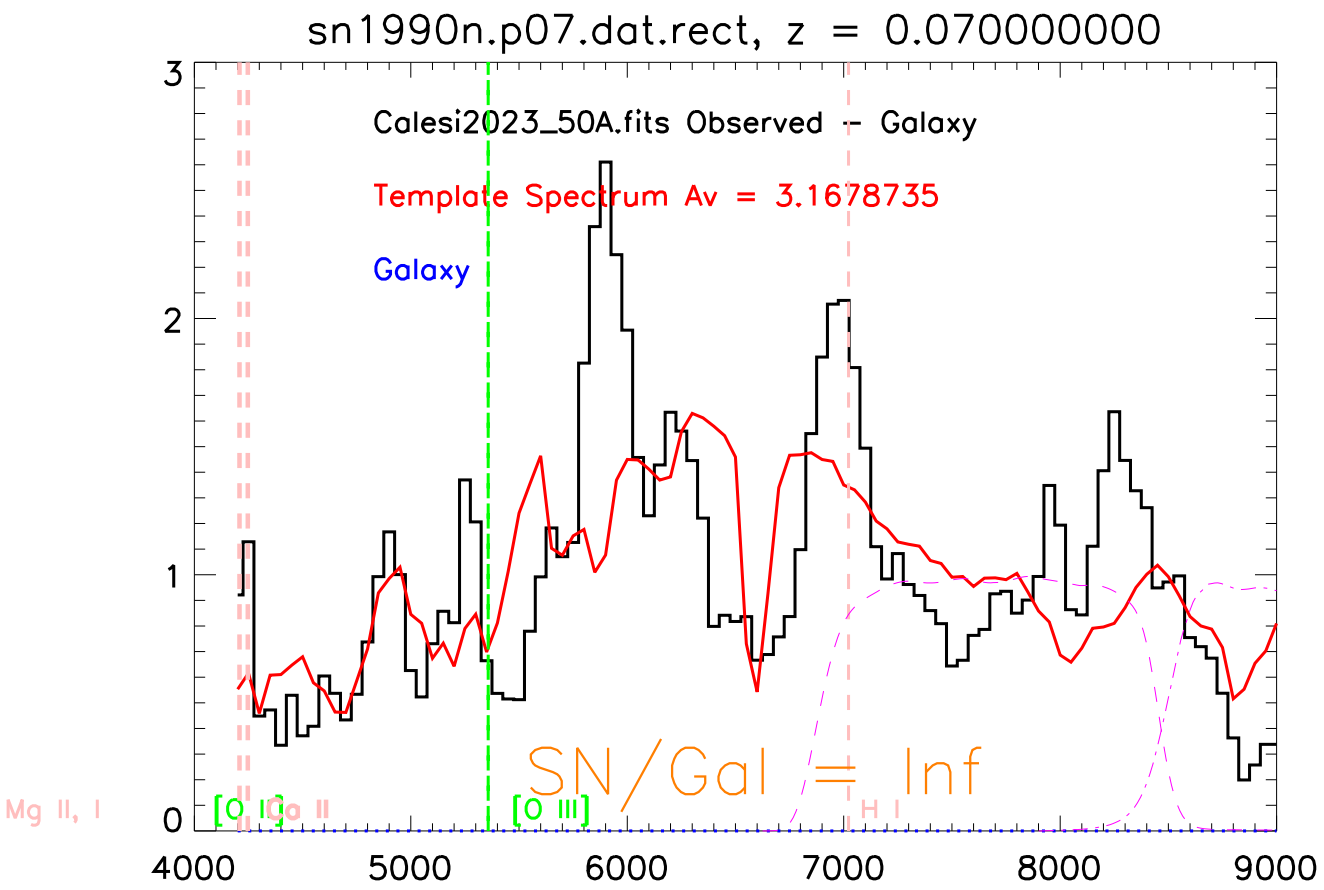
sn1990n.p07.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.1678735
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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7000
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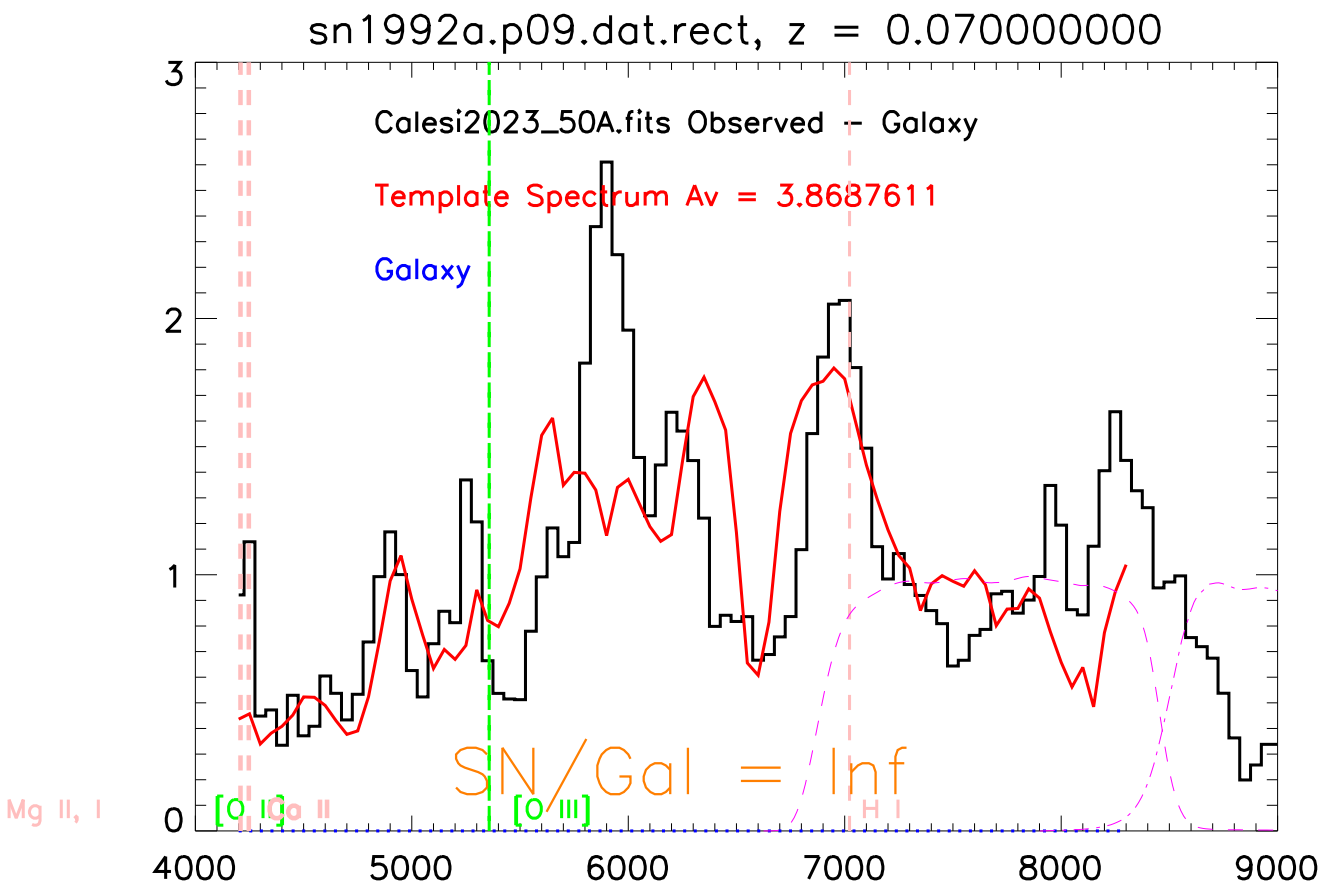
sn1992a.p09.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.8687611
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
0
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4000
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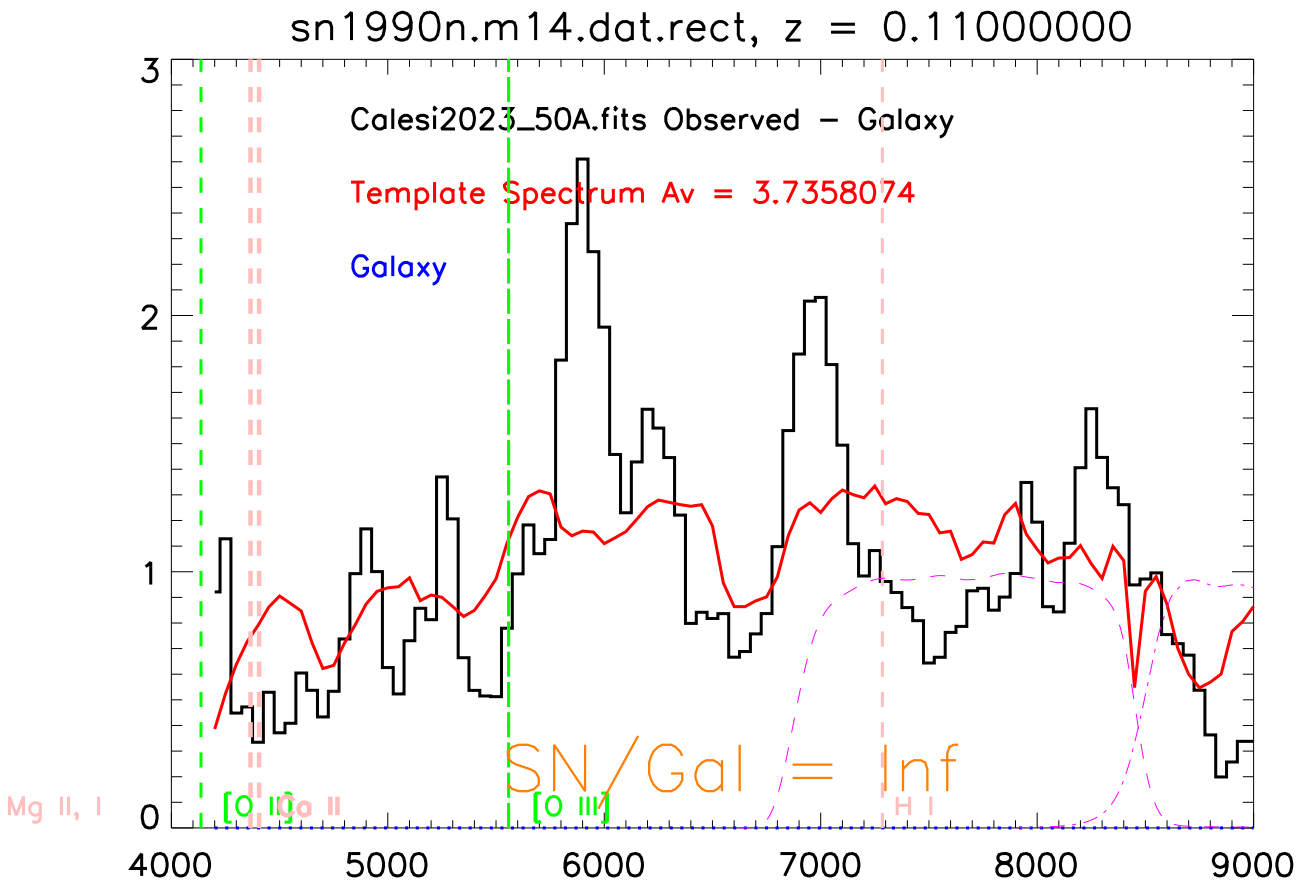
7000
8000
9000


sn1990n.m14.dat.rect, z = 0.11000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 3.7358074
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
0
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4000
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7000
8000
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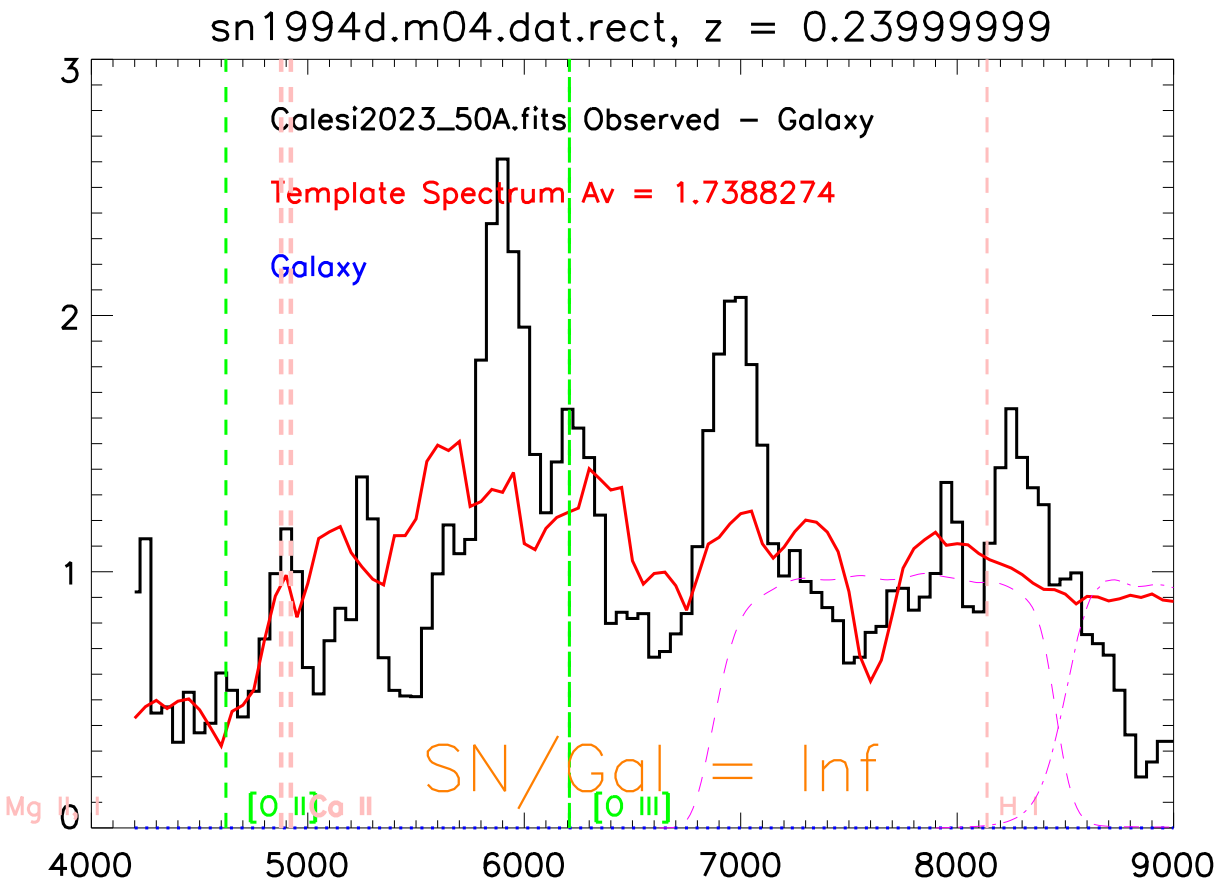
sn1994d.m04.dat.rect, z = 0.23999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 1.7388274
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
Mg II
3
2
1
0
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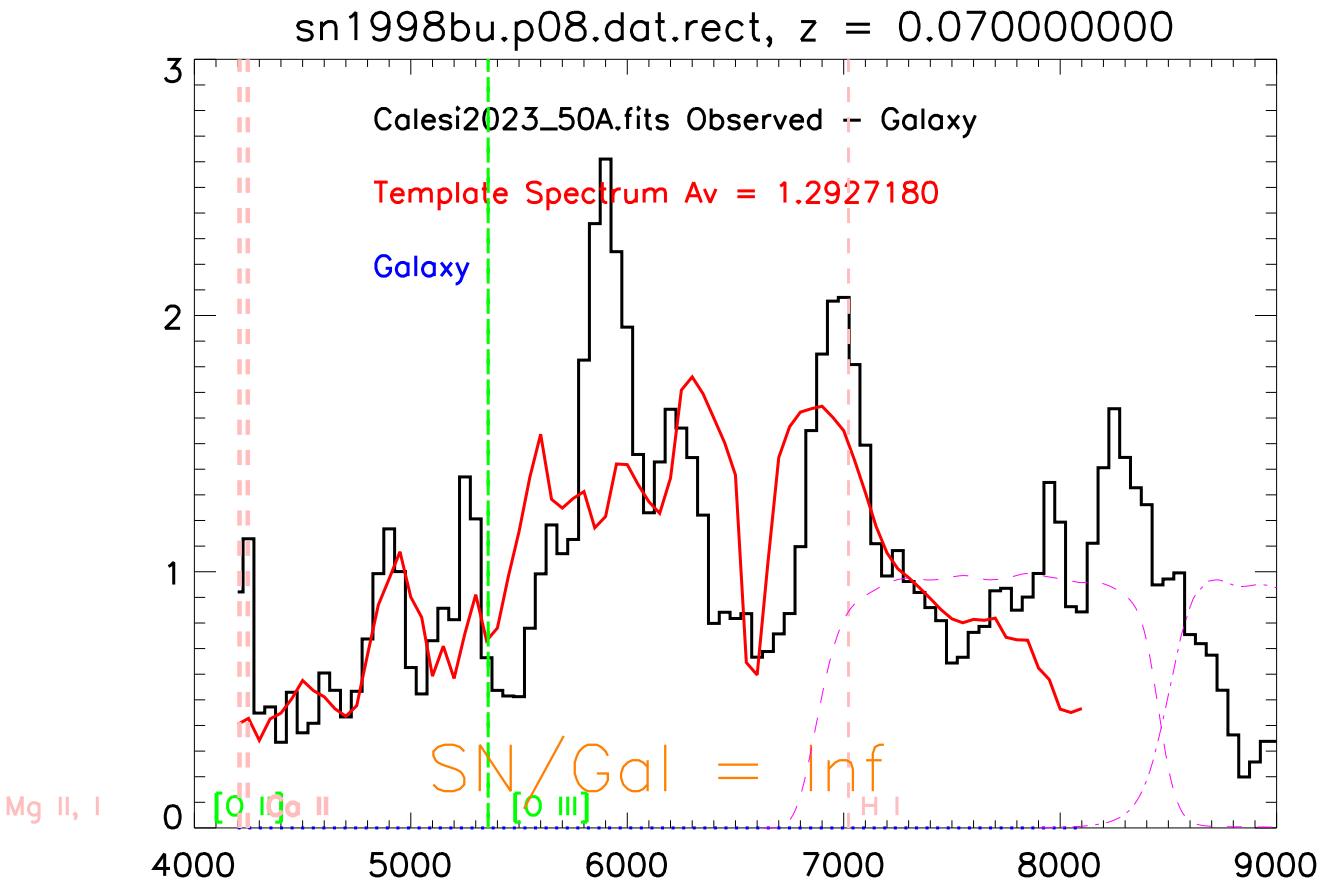
5000
6000
7000
8000
9000


sn1998bu.p08.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.2927180
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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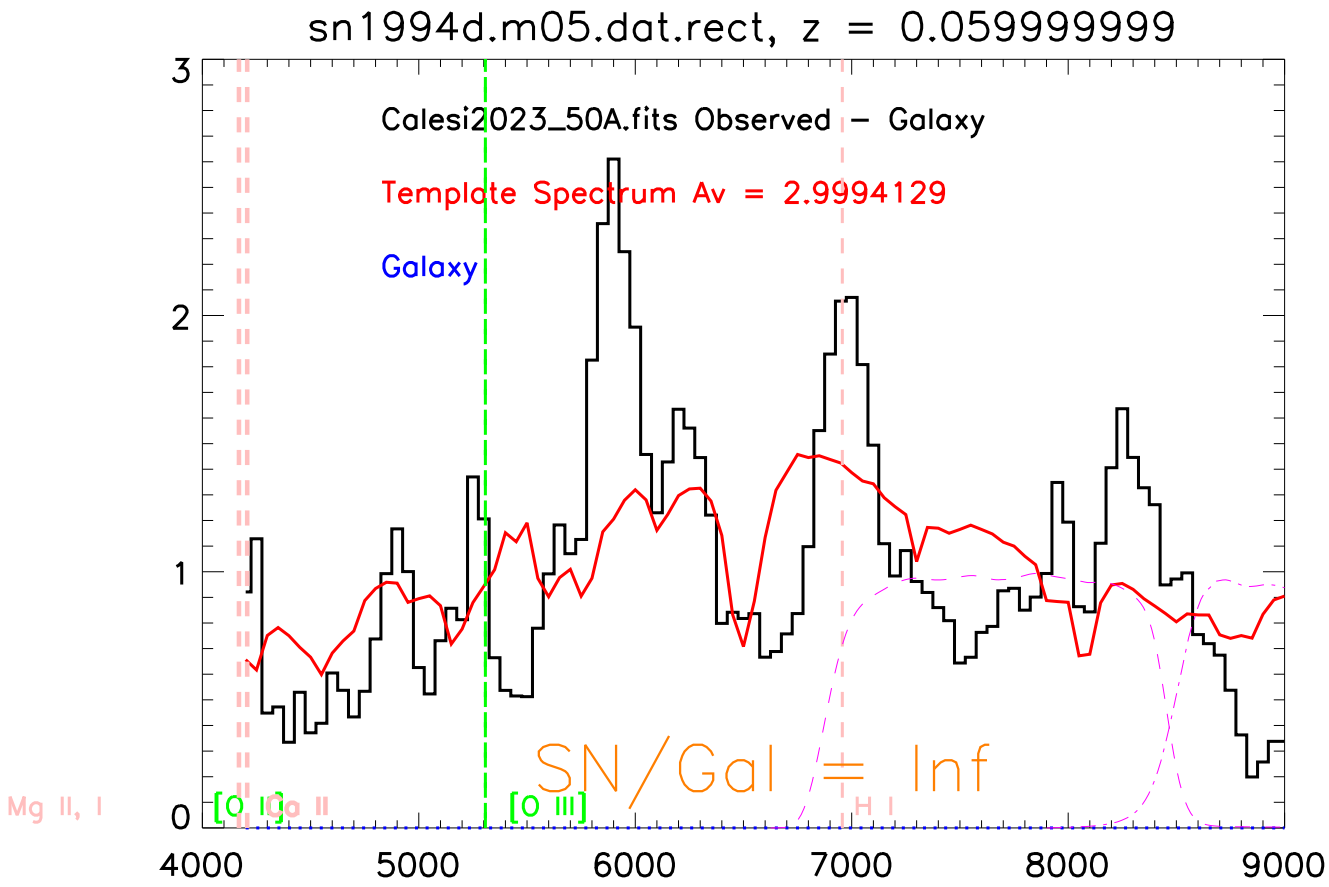
9000


sn1994d.m05.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.9994129
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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8000
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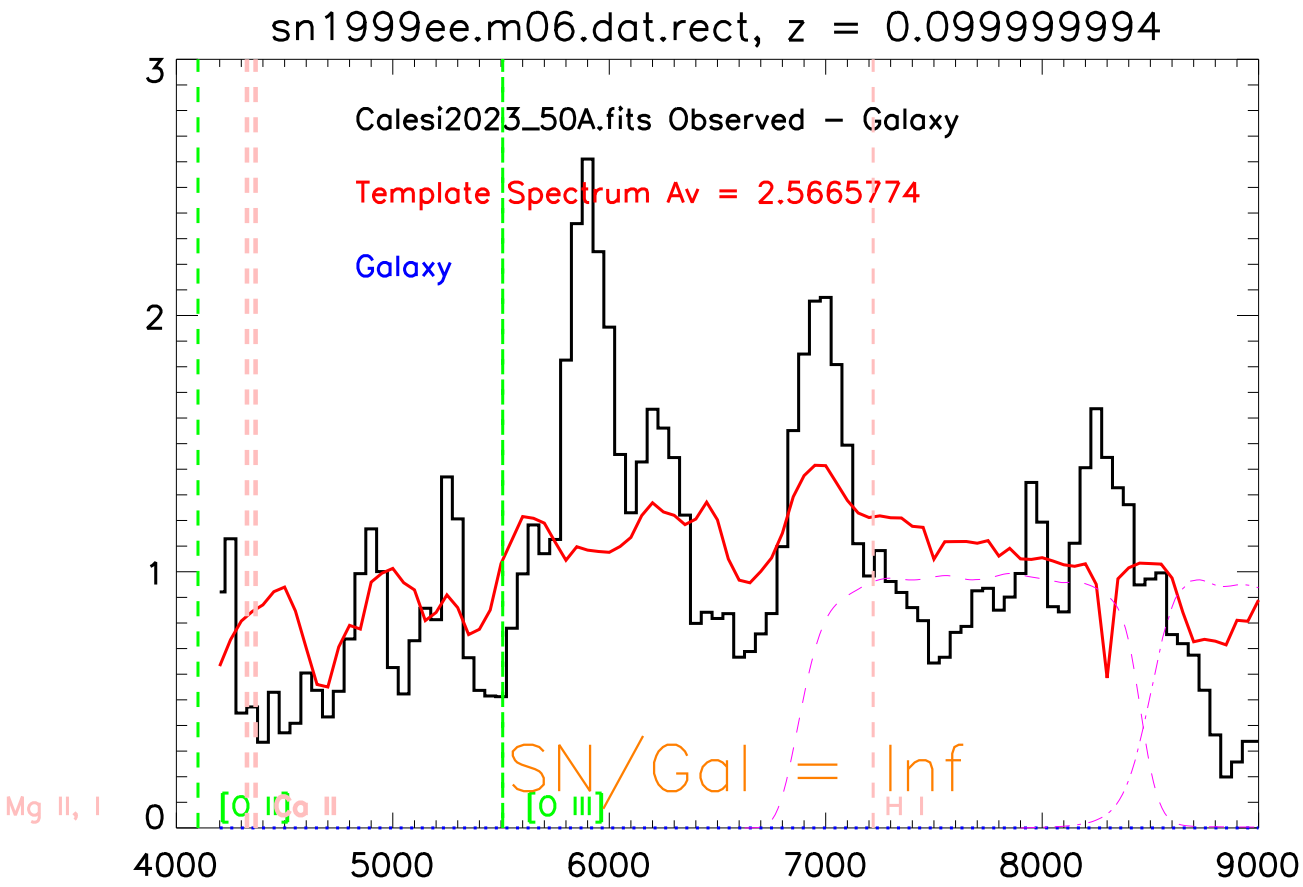
sn1999ee.m06.dat.rect, z = 0.099999994
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.5665774
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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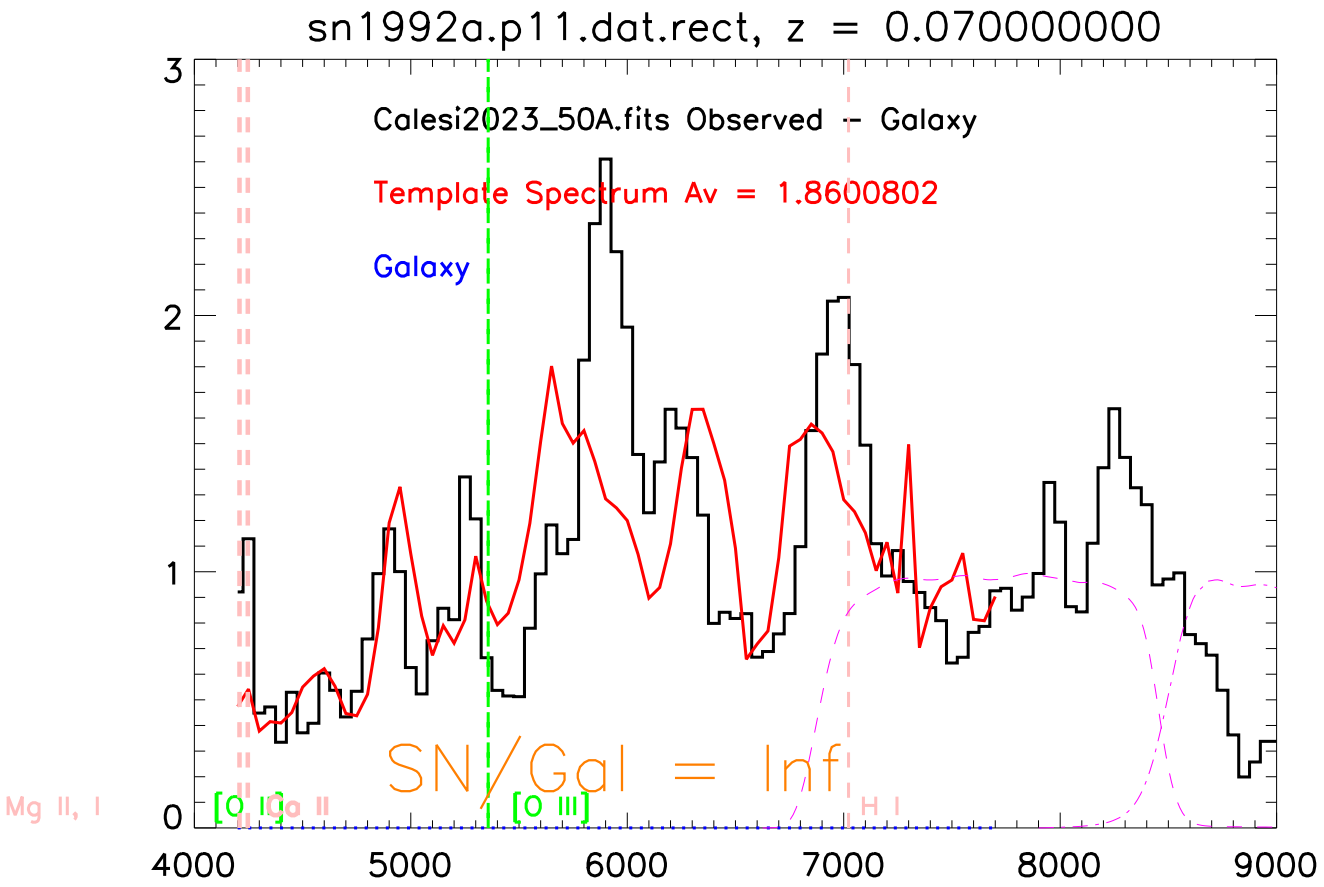
sn1992a.p11.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.8600802
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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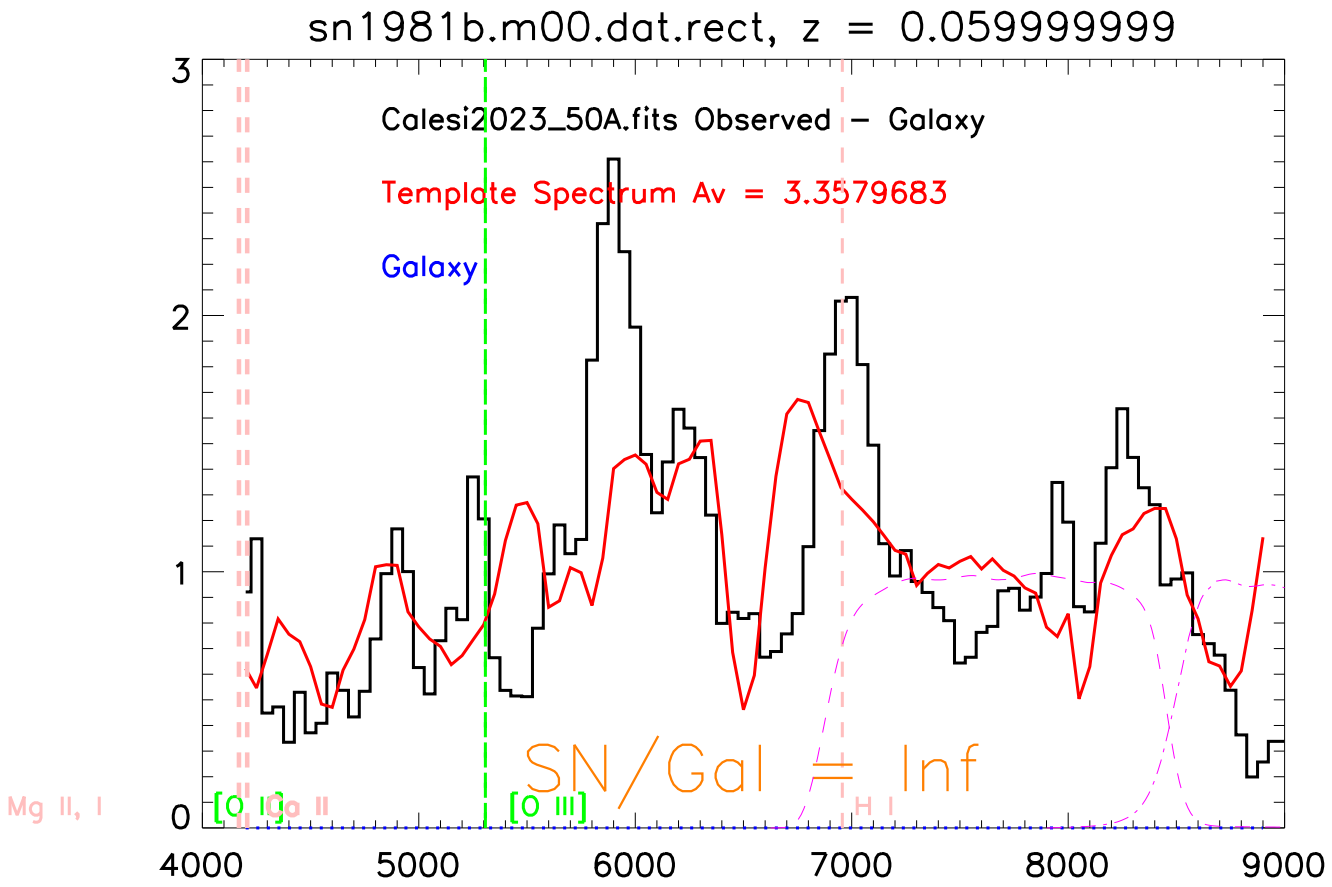
sn1981b.m00.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.3579683
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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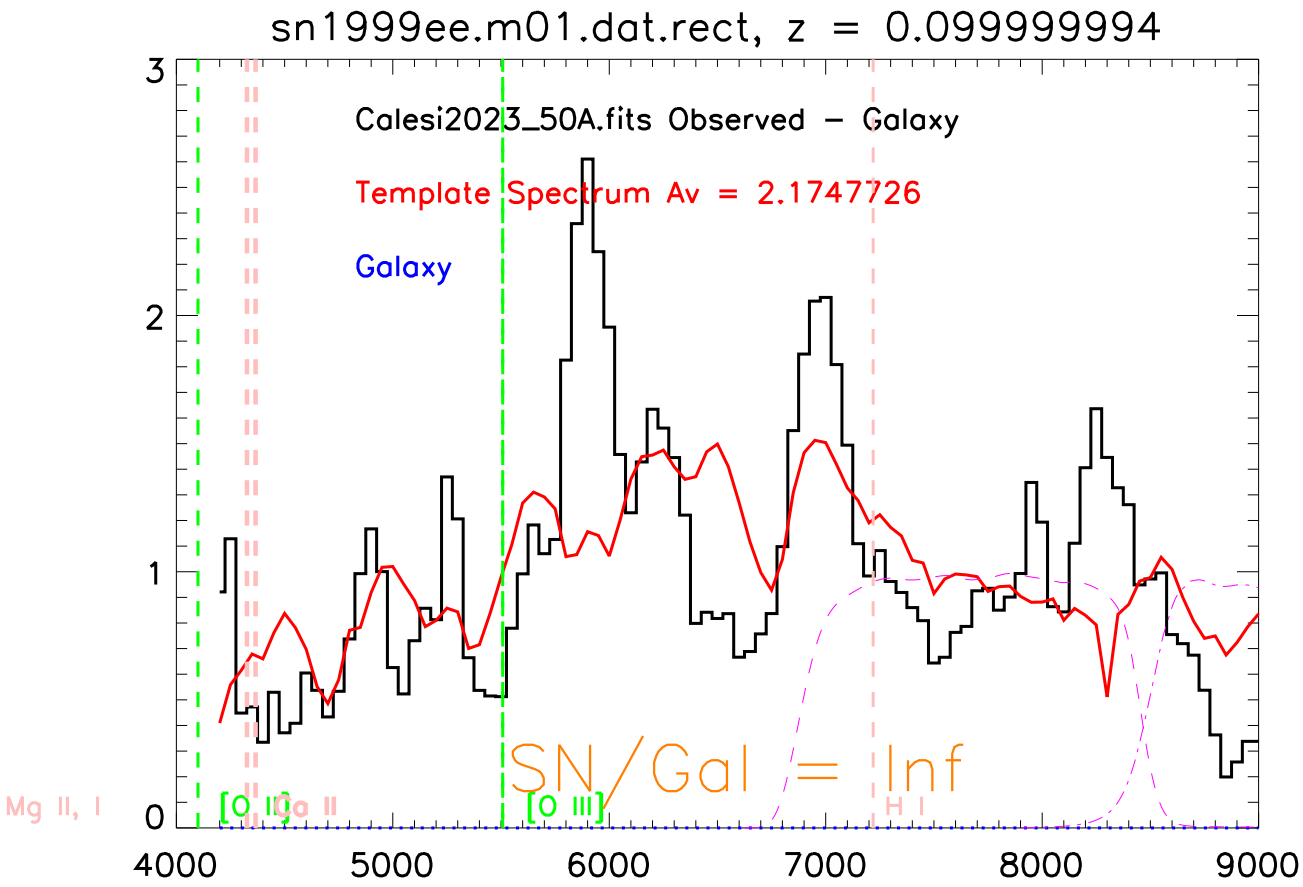
sn1999ee.m01.dat.rect, z = 0.099999994
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.1747726
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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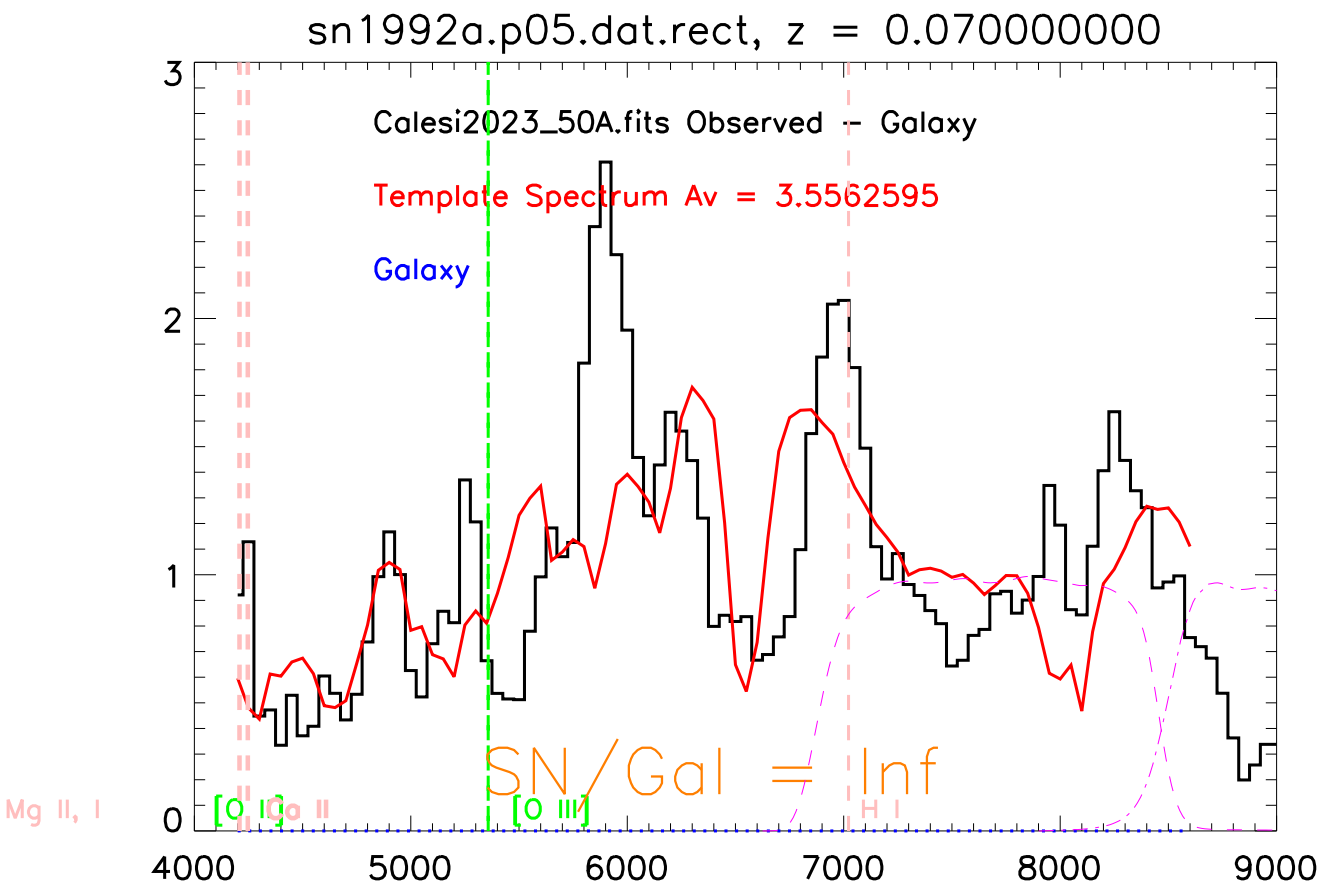
7000
8000
9000


sn1992a.p05.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.5562595
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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8000
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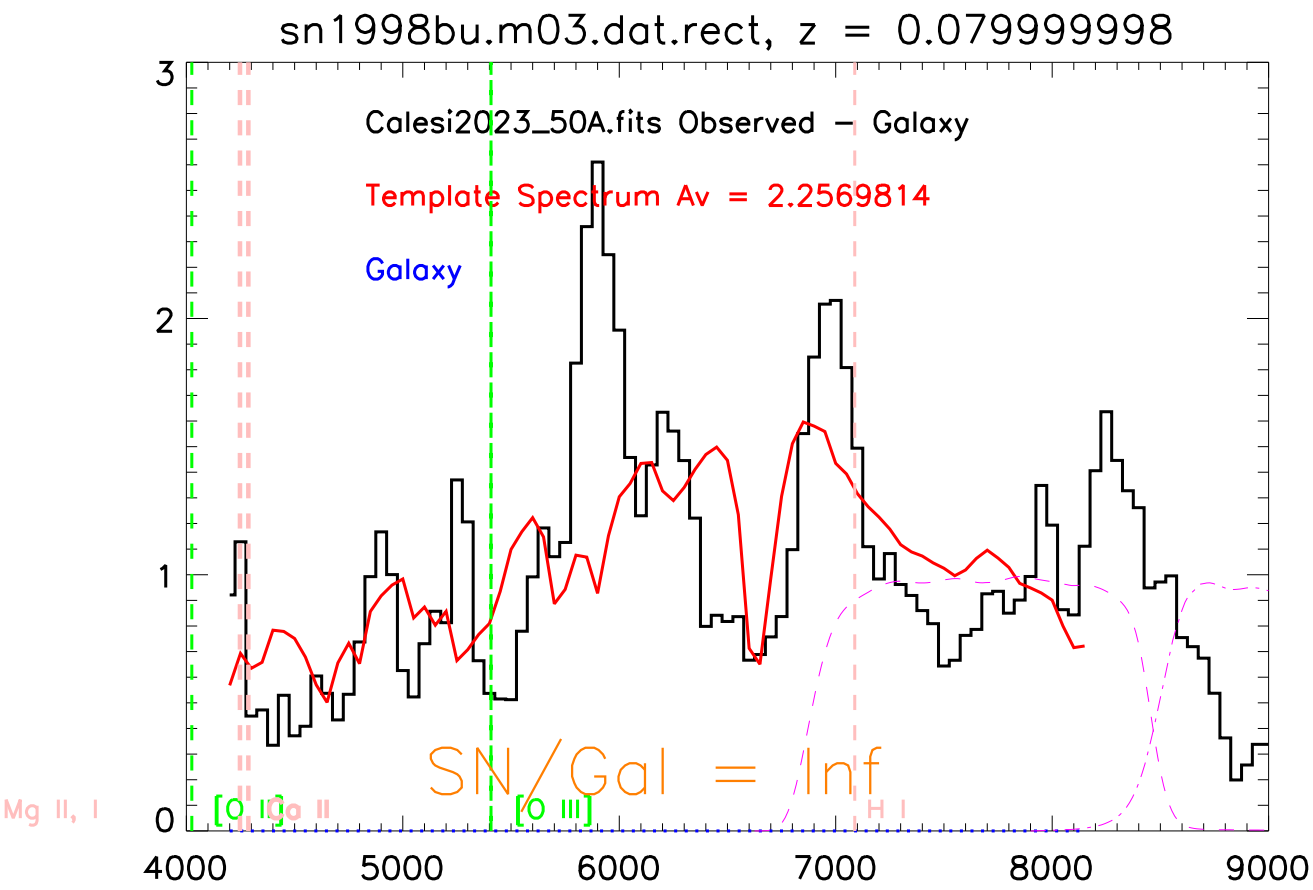
sn1998bu.m03.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.2569814
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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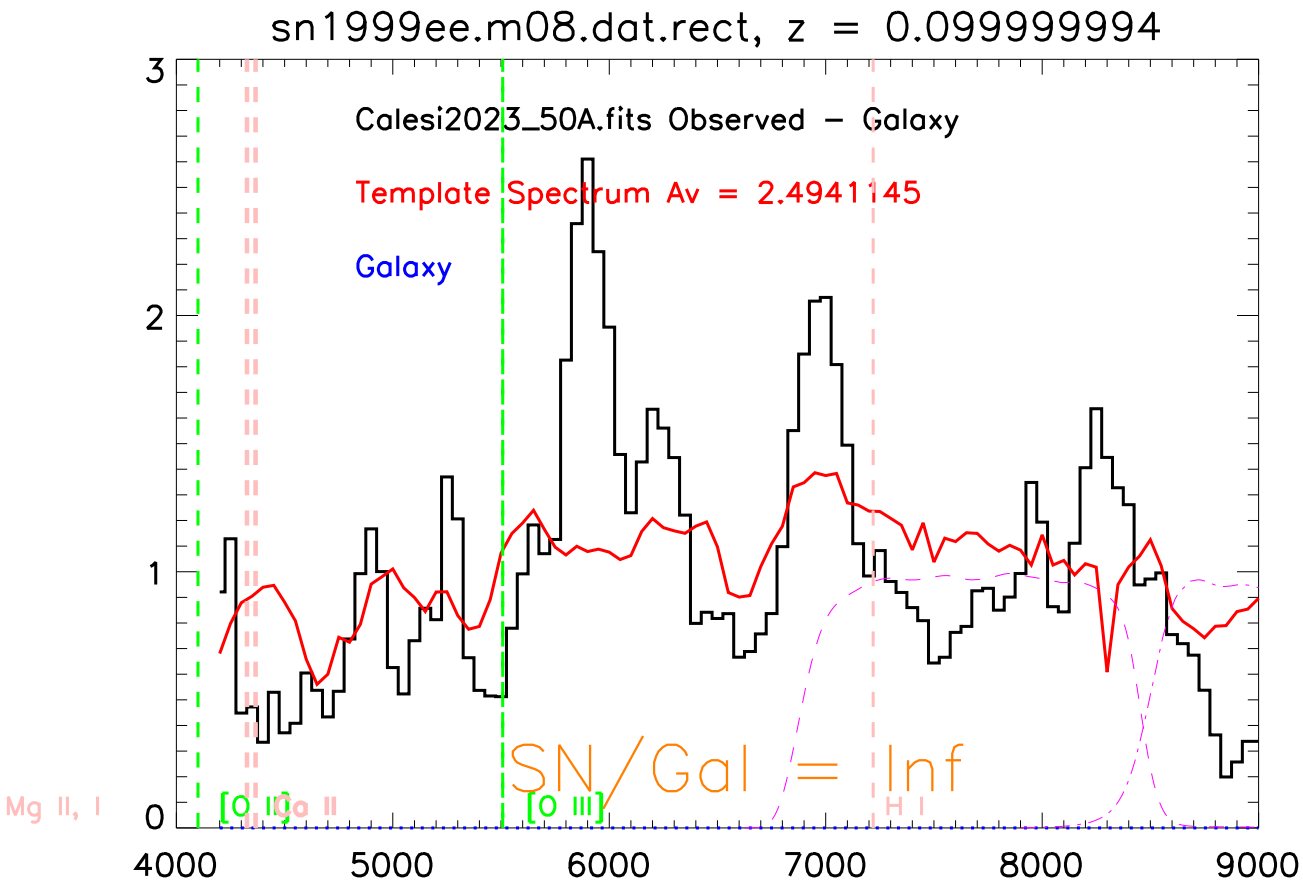
8000
9000


sn1999ee.m08.dat.rect, z = 0.099999994
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.4941145
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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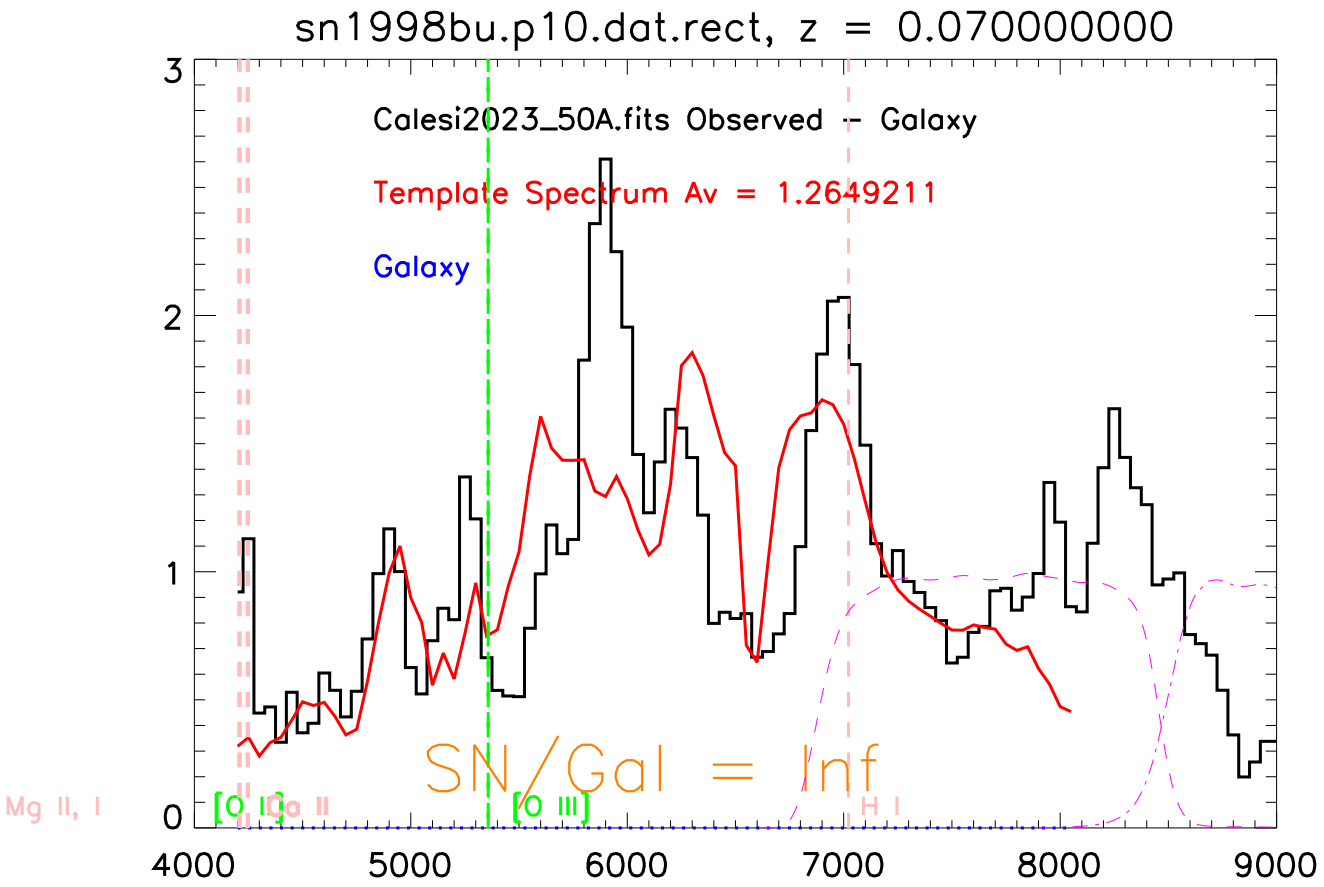
9000


sn1998bu.p10.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.2649211
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
3
2
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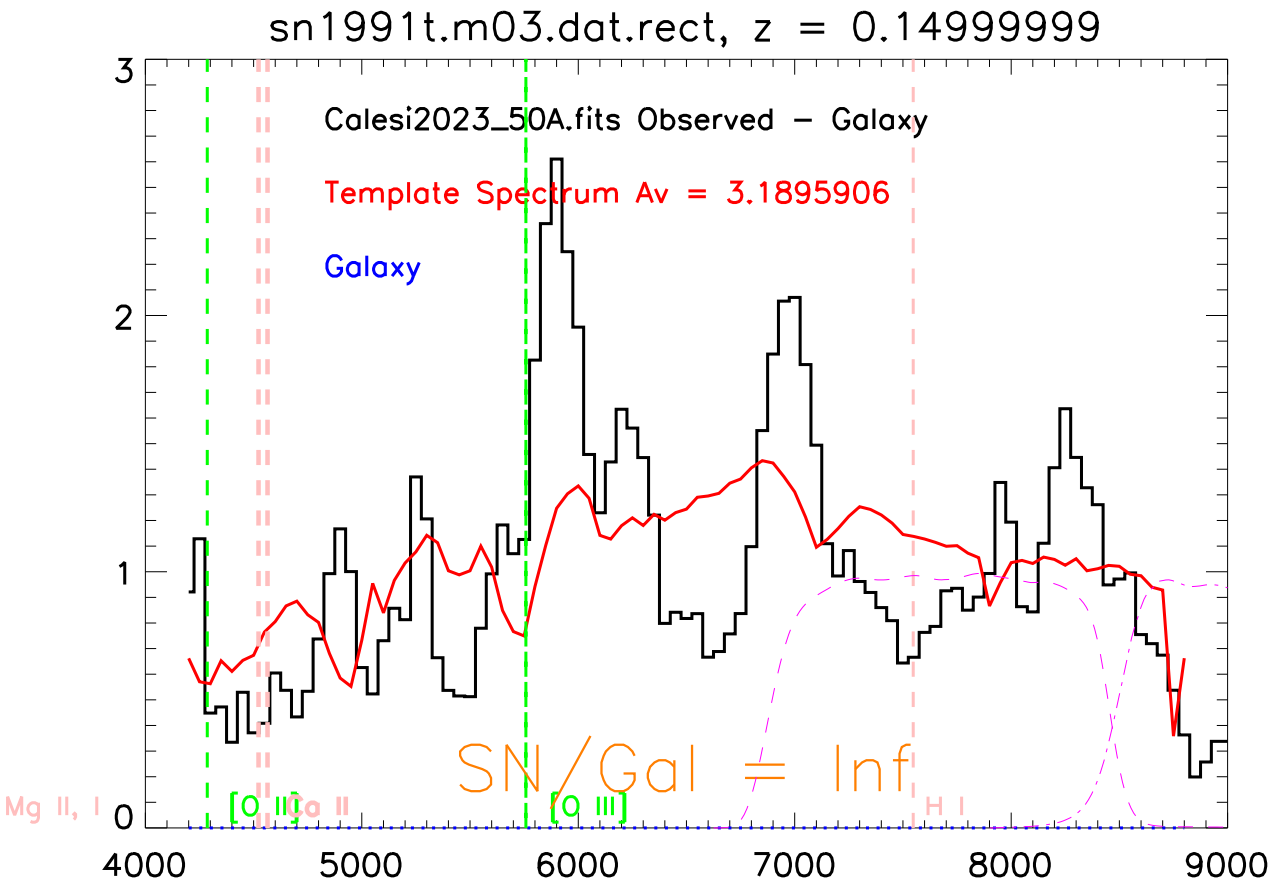
4000
5000
6000
7000
8000
9000


sn1991t.m03.dat.rect, z = 0.14999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 3.1895906
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
0
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4000
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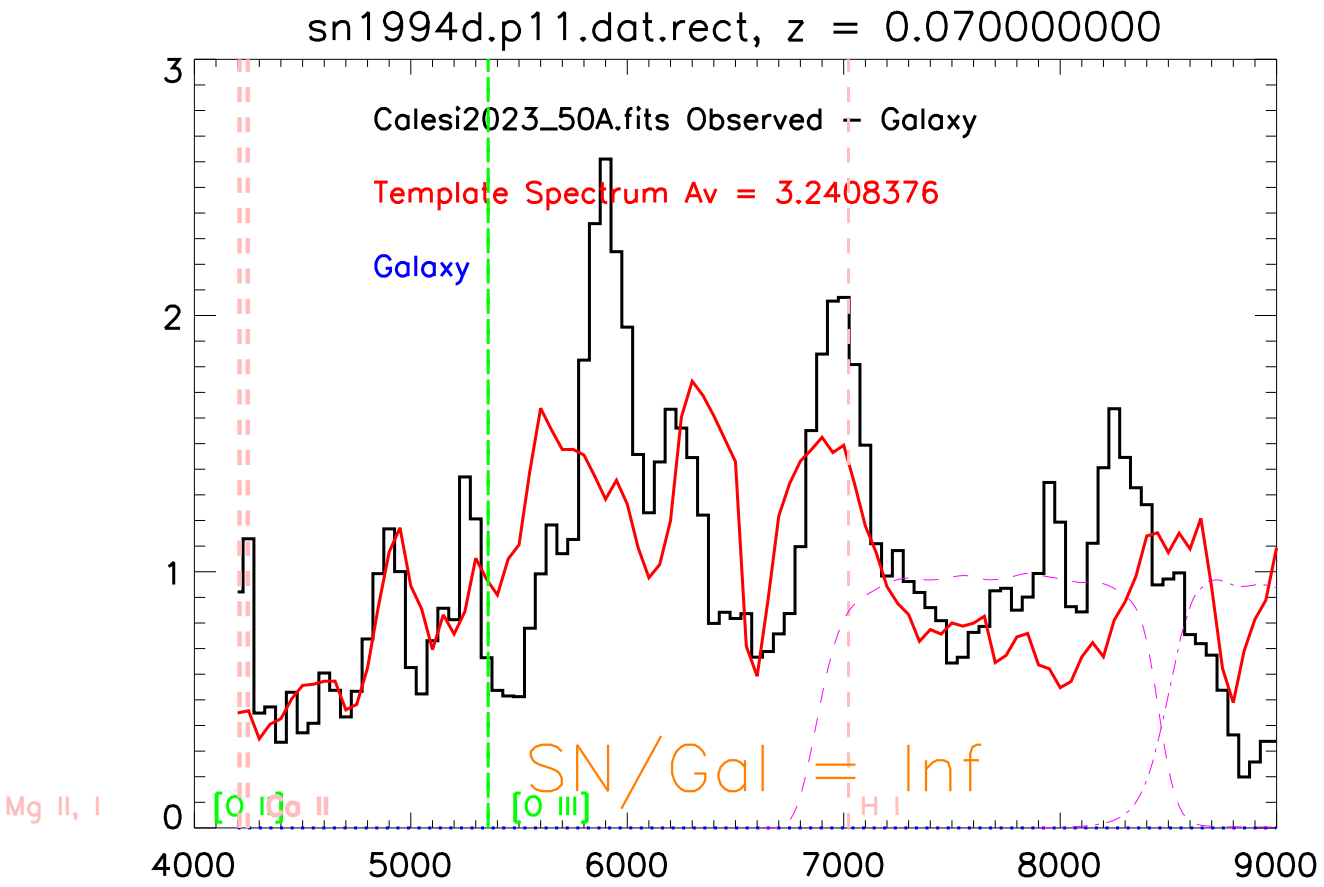
6000
7000
8000
9000


sn1994d.p11.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 3.2408376
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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7000
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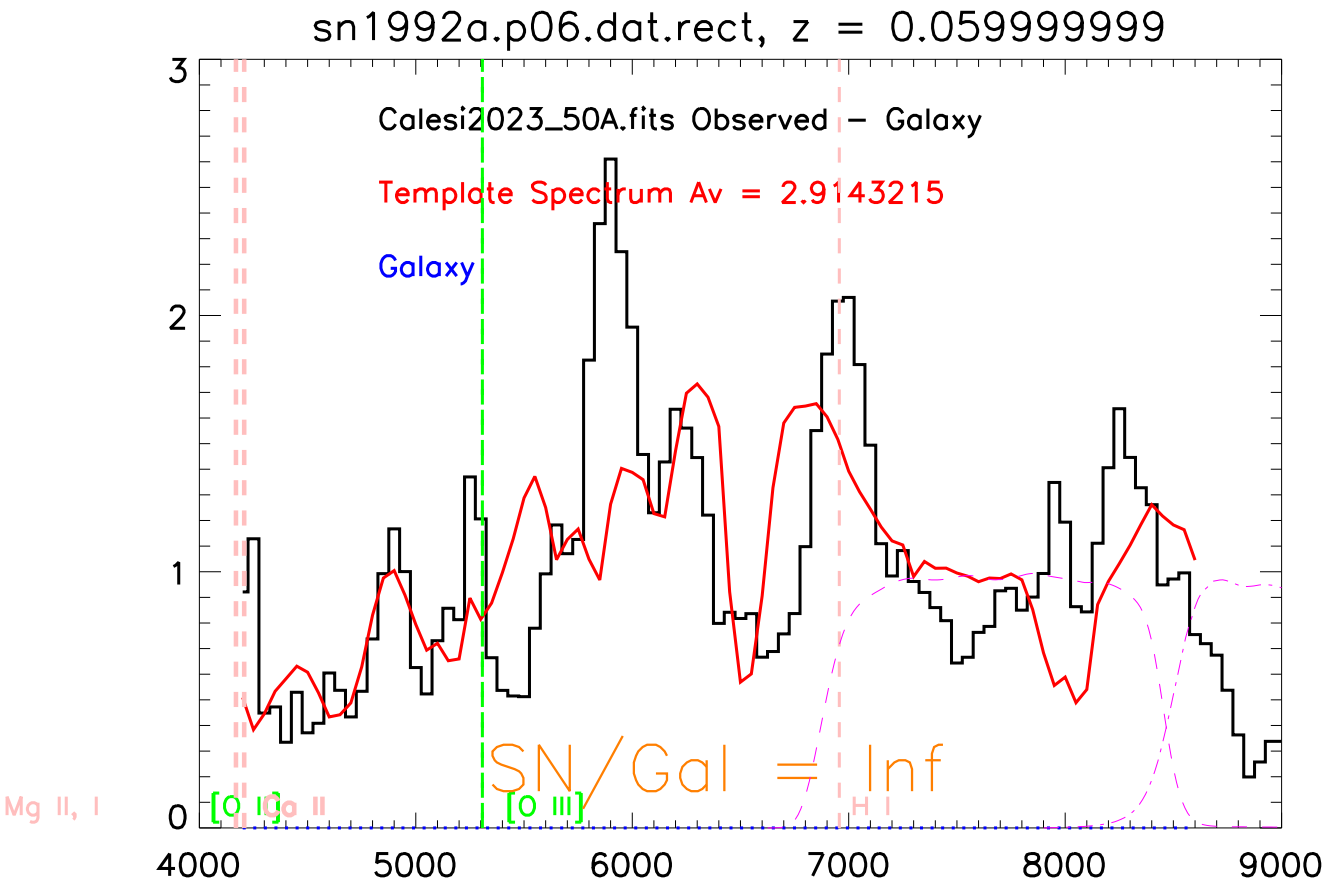
9000


sn1992a.p06.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.9143215
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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8000
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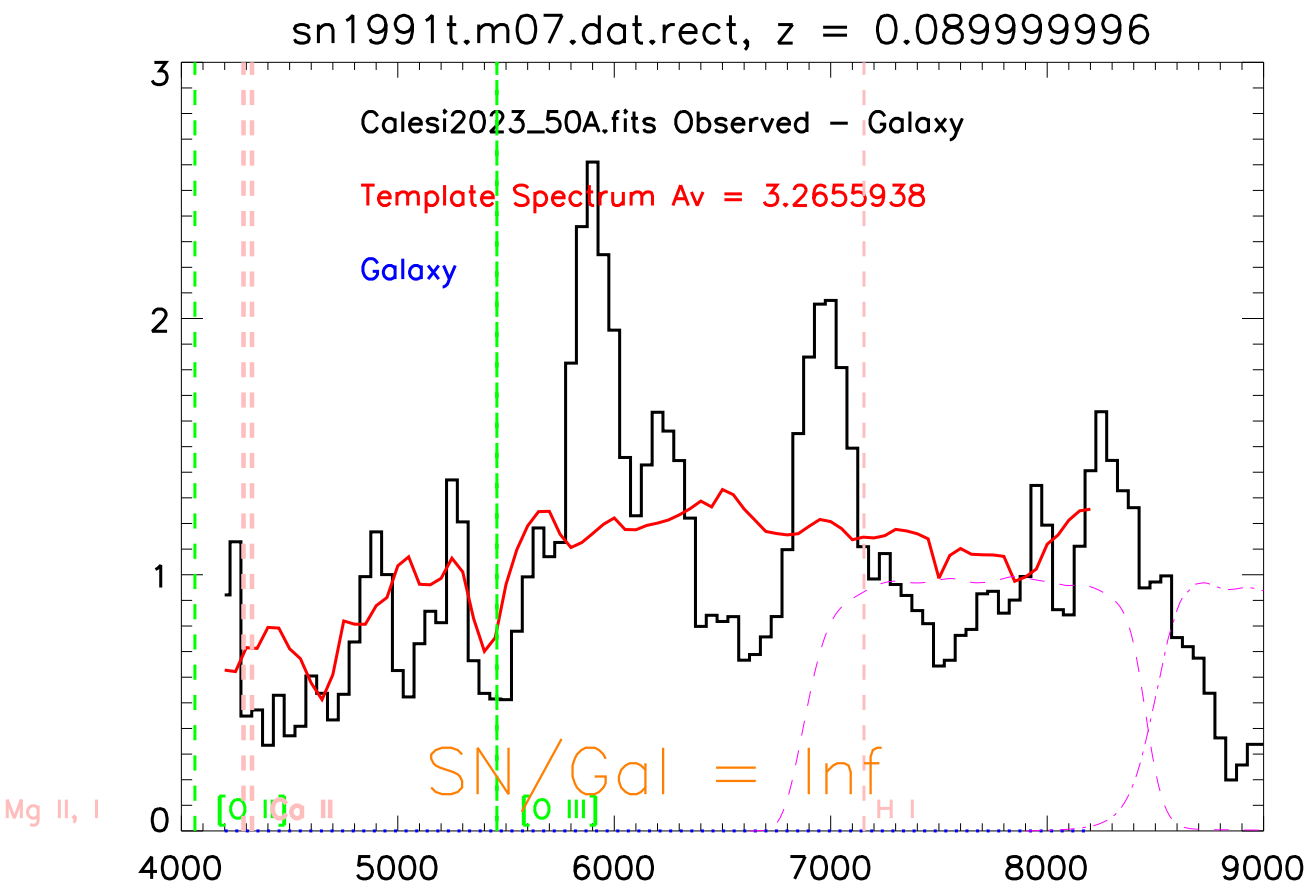
sn1991t.m07.dat.rect, z = 0.089999996
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 3.2655938
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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4000
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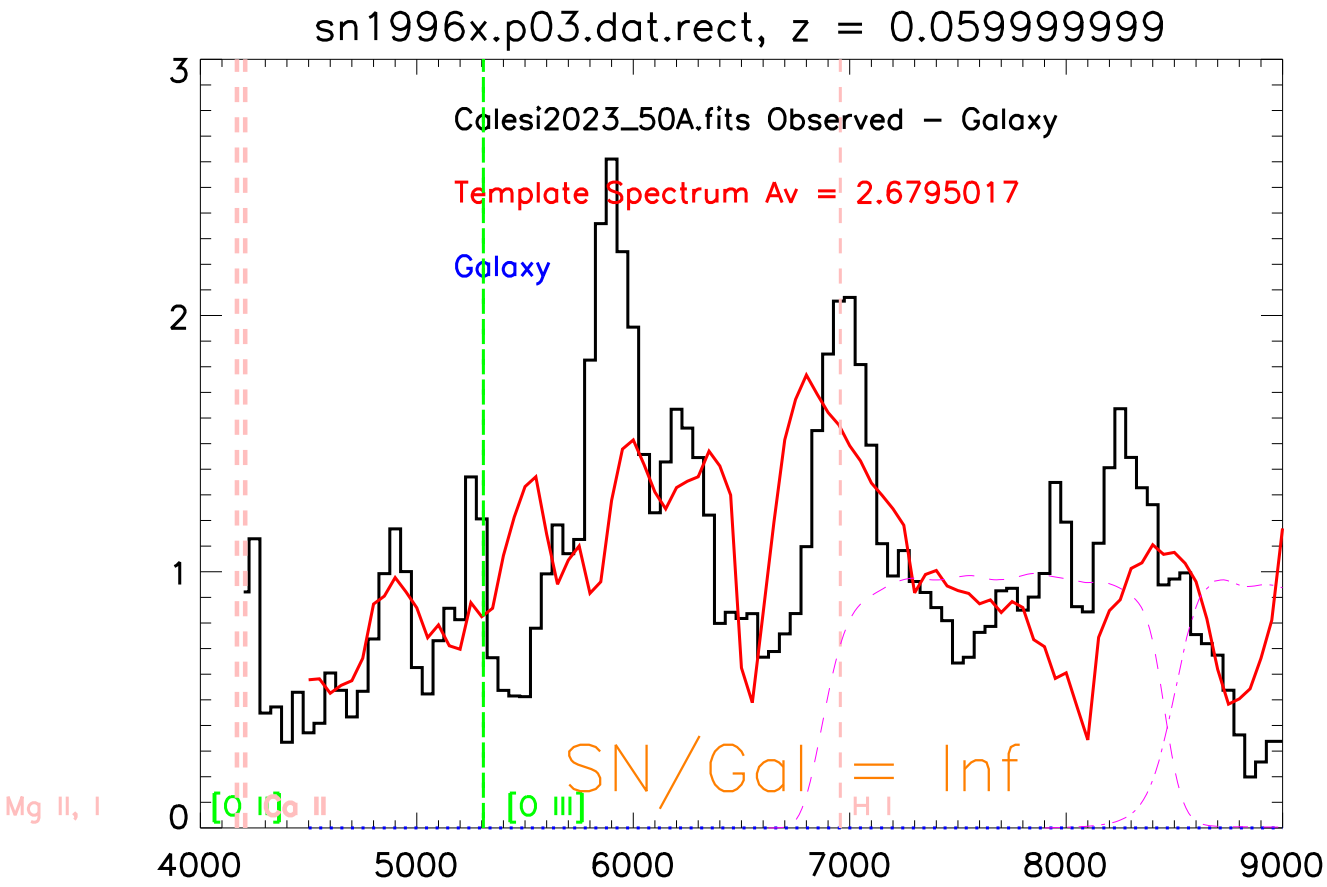
7000
8000
9000


sn1996x.p03.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.6795017
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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7000
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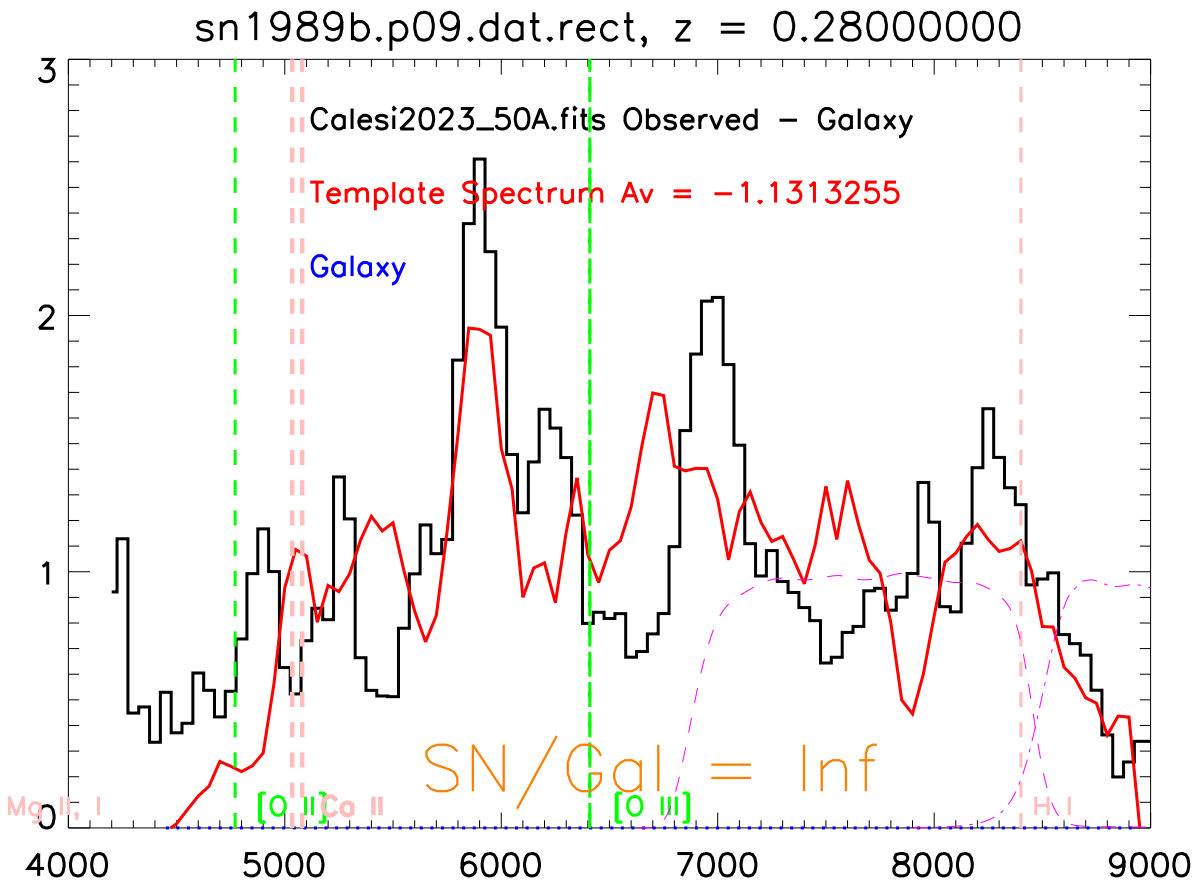
9000


sn1989b.p09.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −1.1313255
Galaxy
SN/Gal = Inf
[O II]
Ca II
[O III]
H I
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8000
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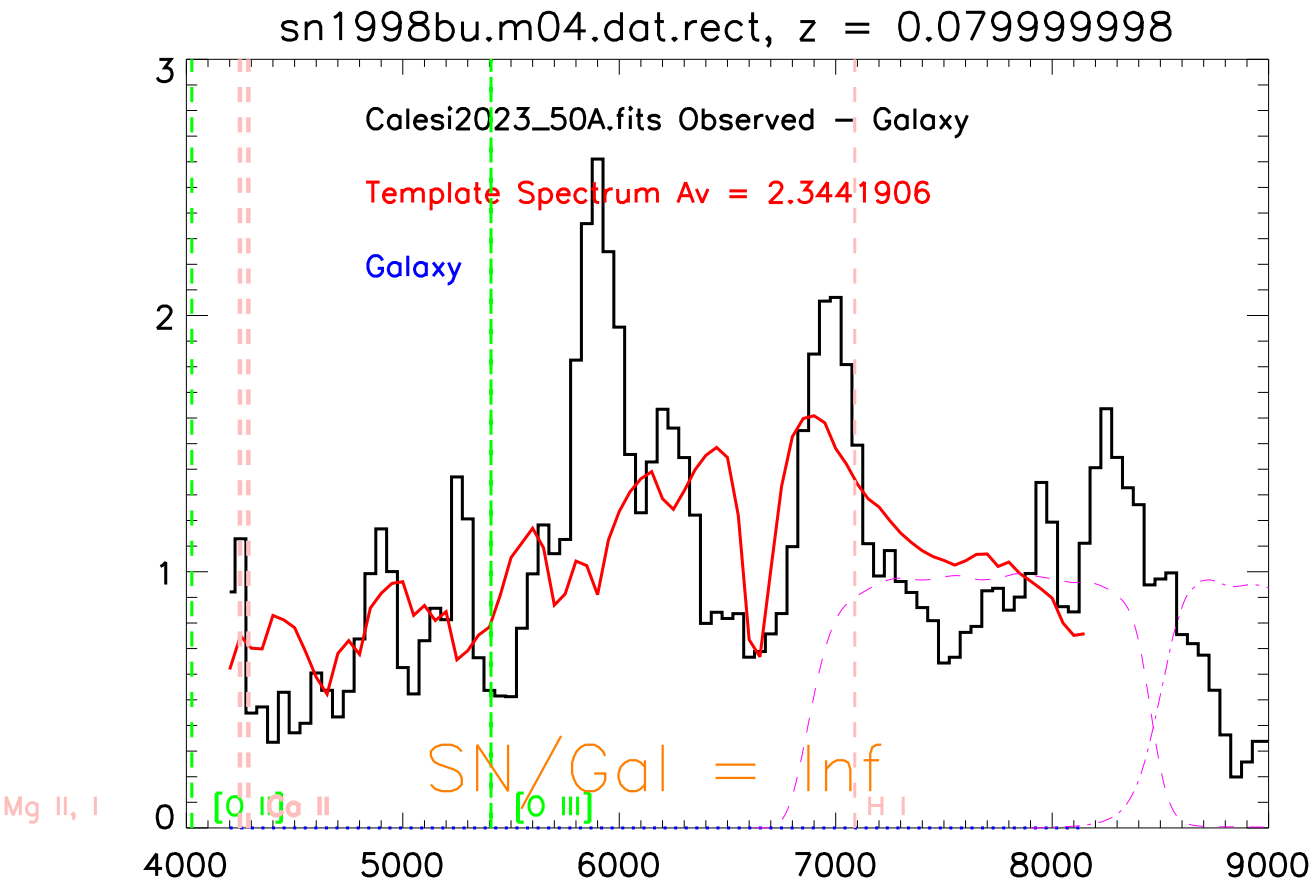
sn1998bu.m04.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.3441906
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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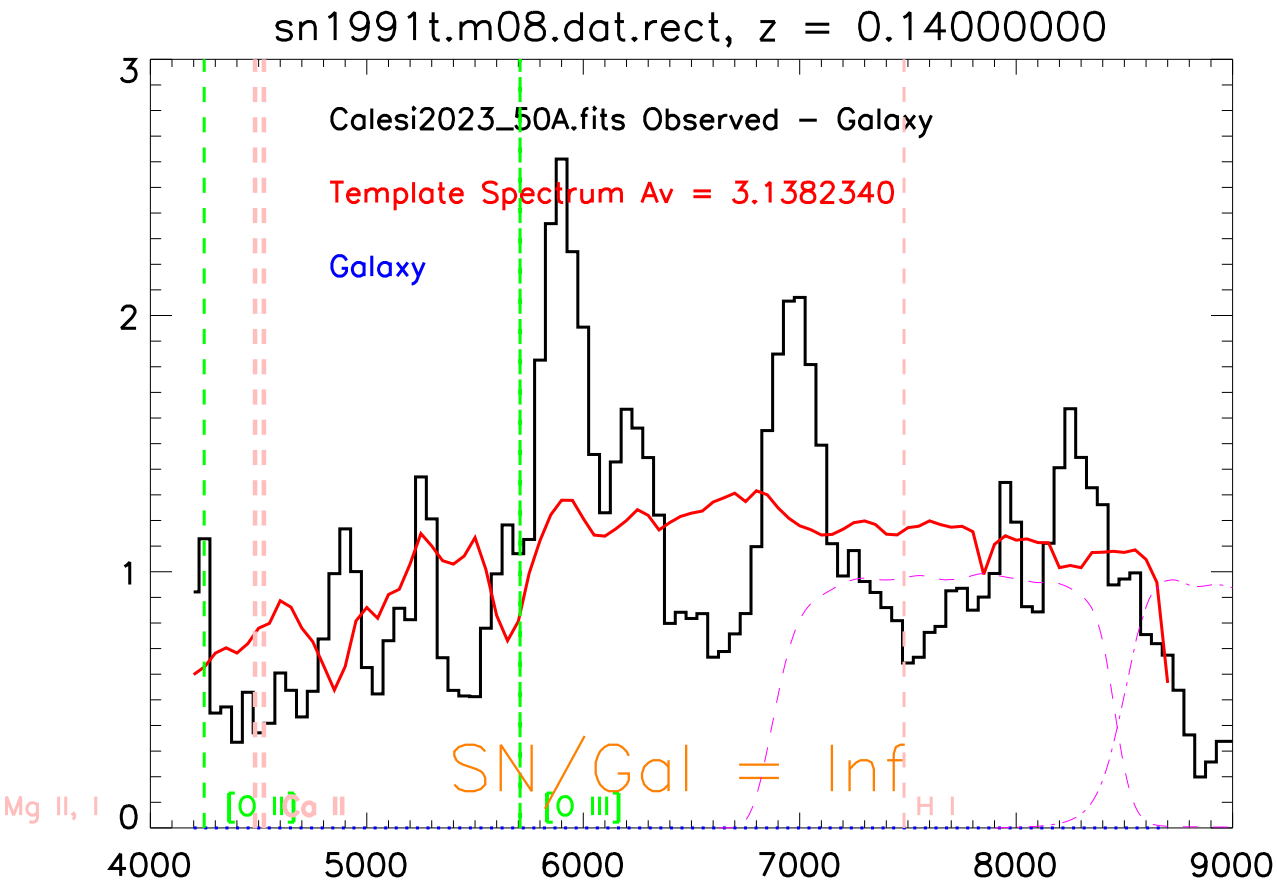
sn1991t.m08.dat.rect, z = 0.14000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 3.1382340
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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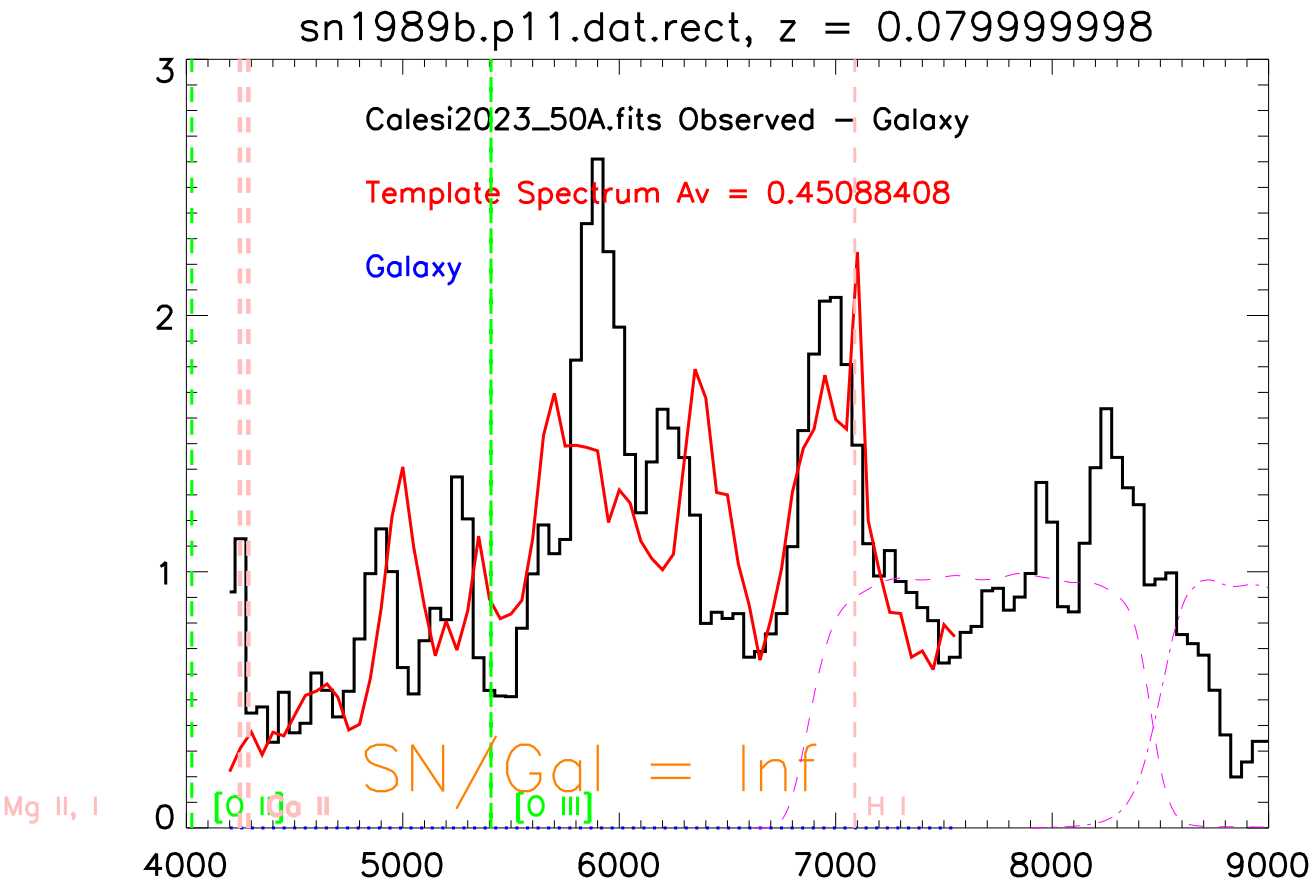
sn1989b.p11.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 0.45088408
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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8000
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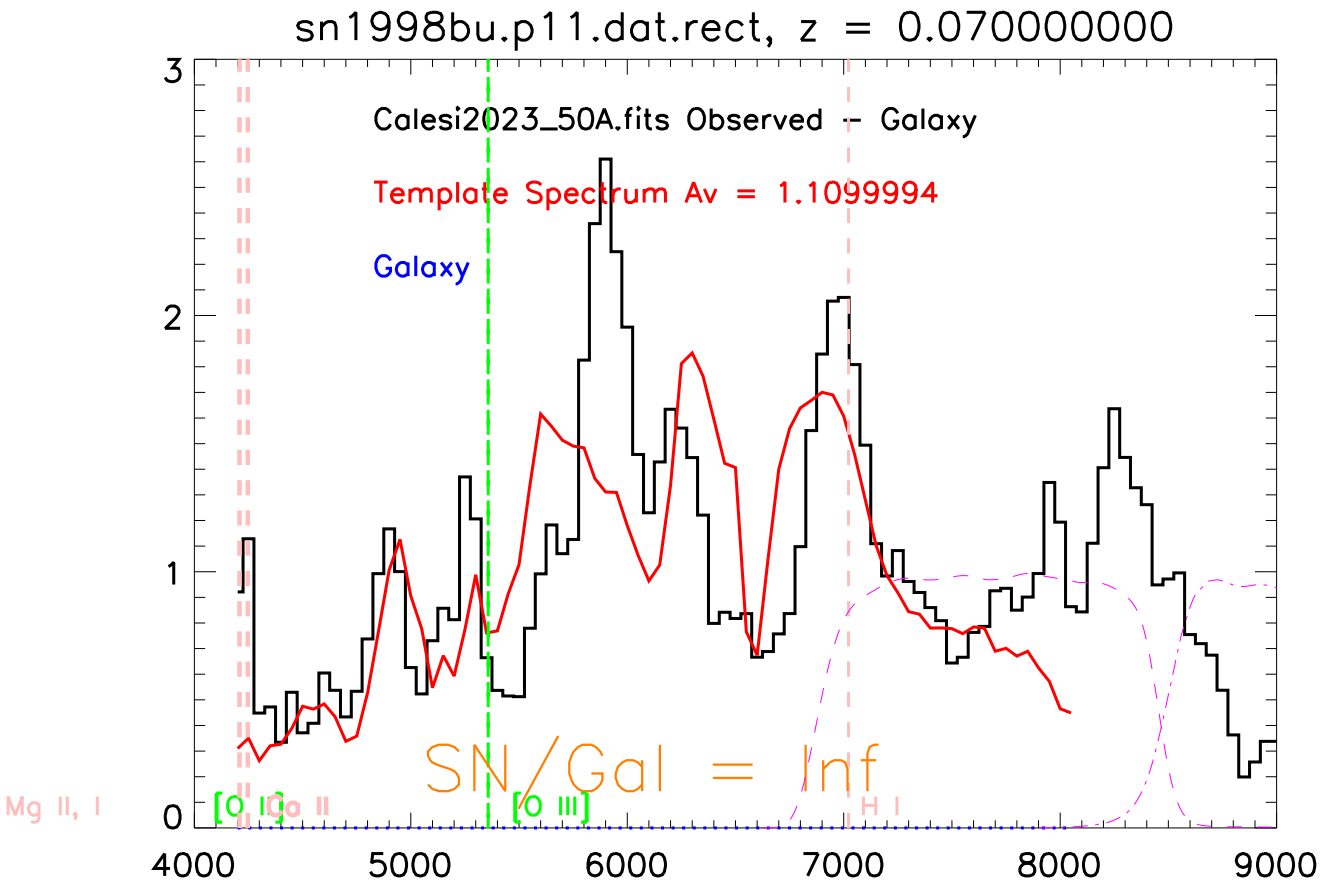
sn1998bu.p11.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.1099994
Galaxy
SN/Gal = Inf
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Ca II
[O III]
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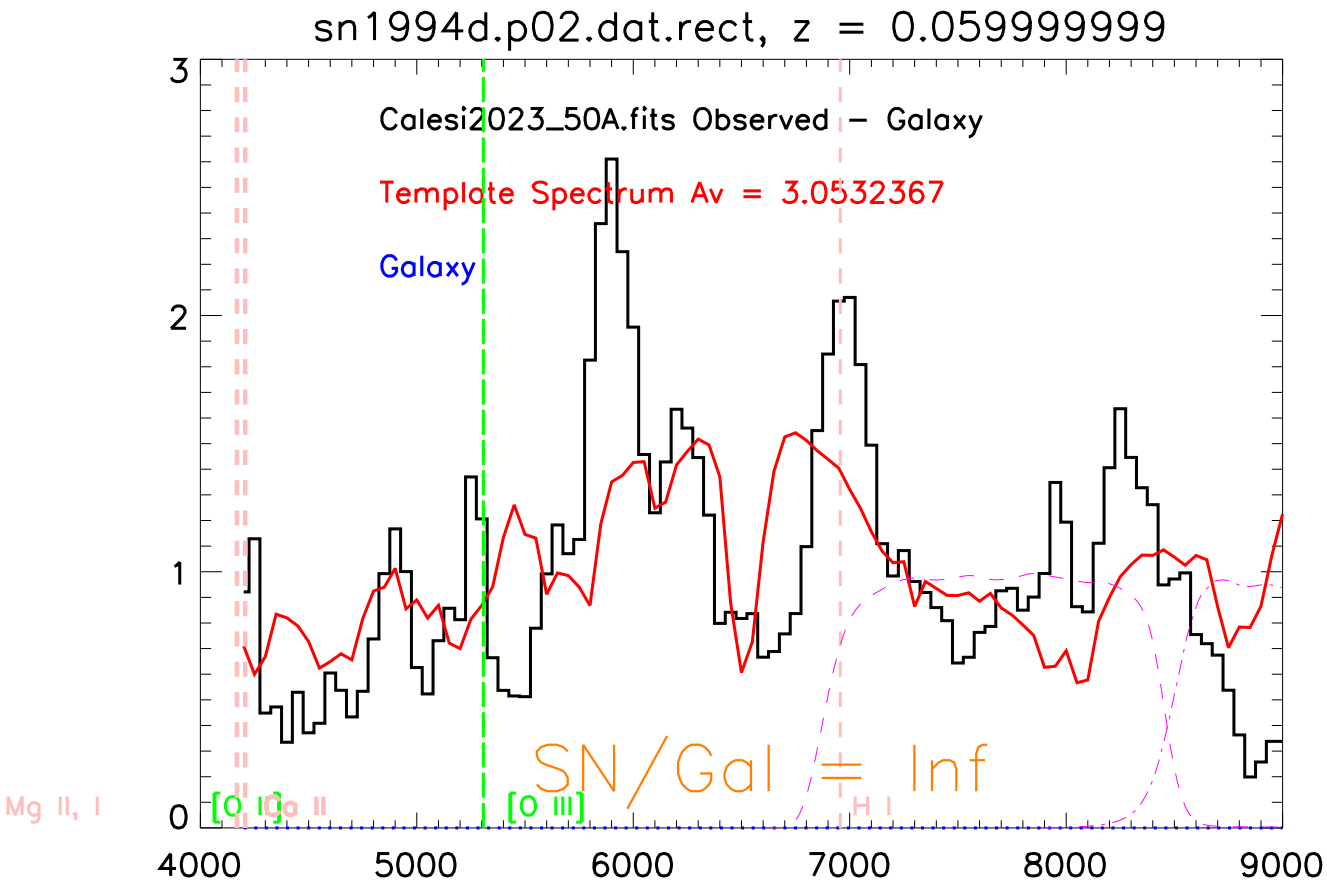
sn1994d.p02.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.0532367
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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8000
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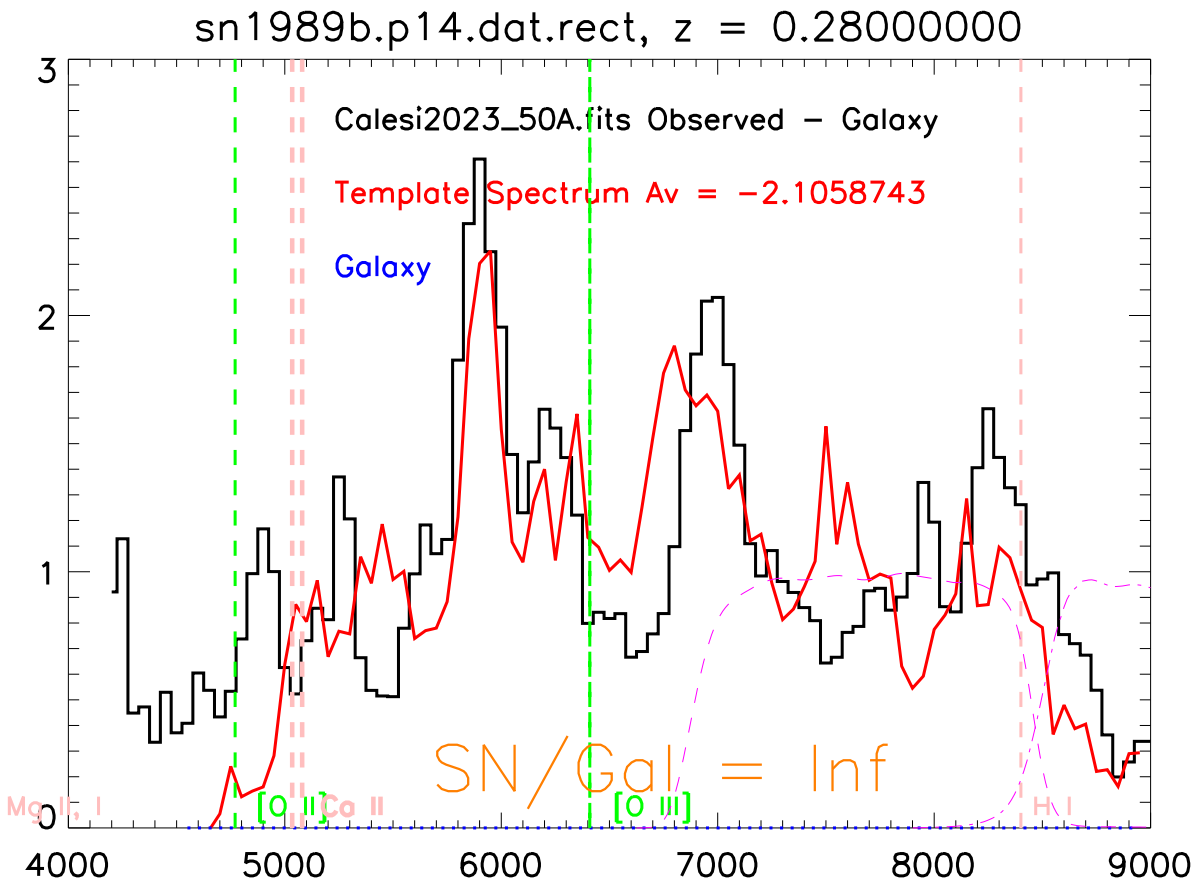
sn1989b.p14.dat.rect, z = 0.28000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −2.1058743
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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0
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7000
8000
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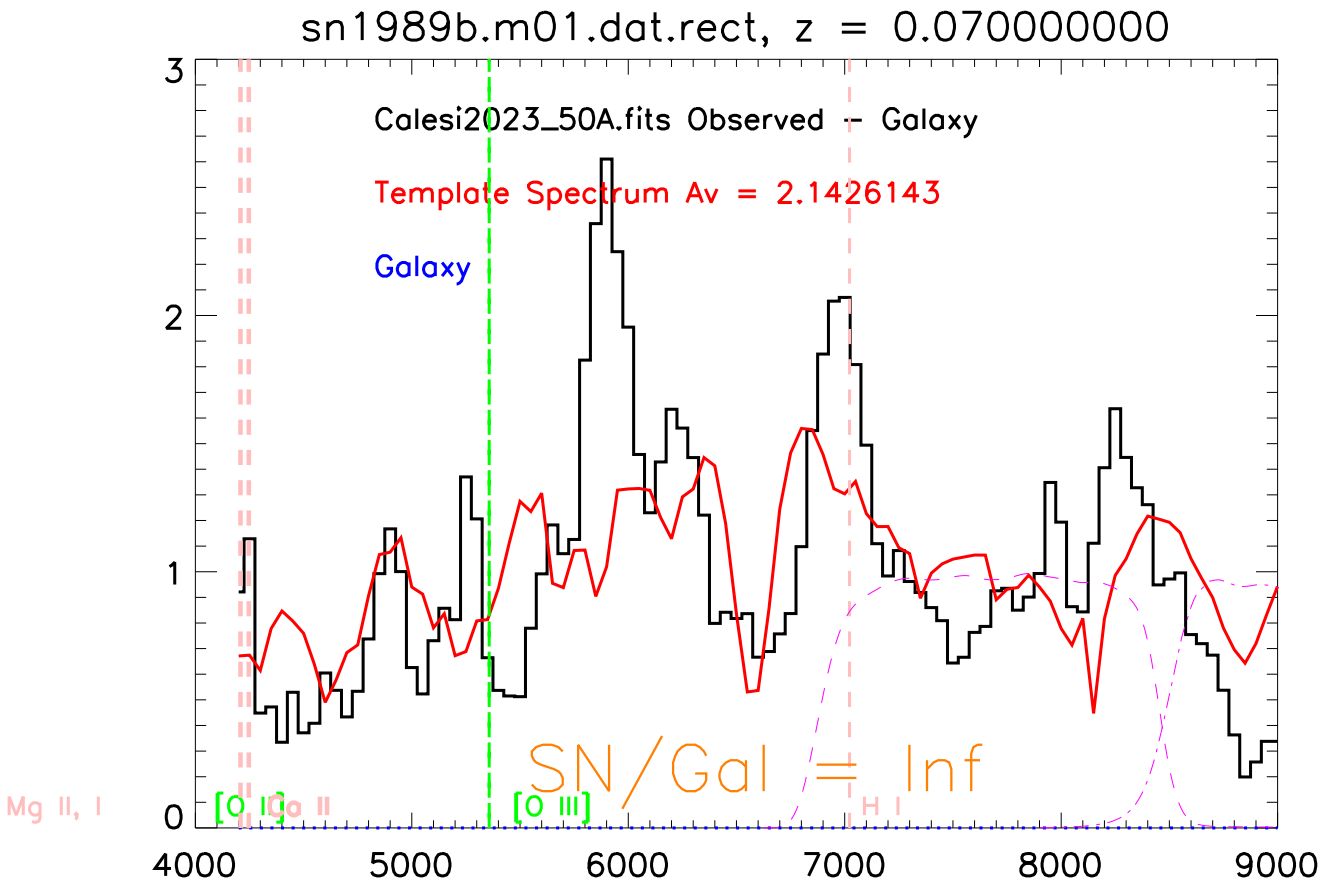
sn1989b.m01.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 2.1426143
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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0
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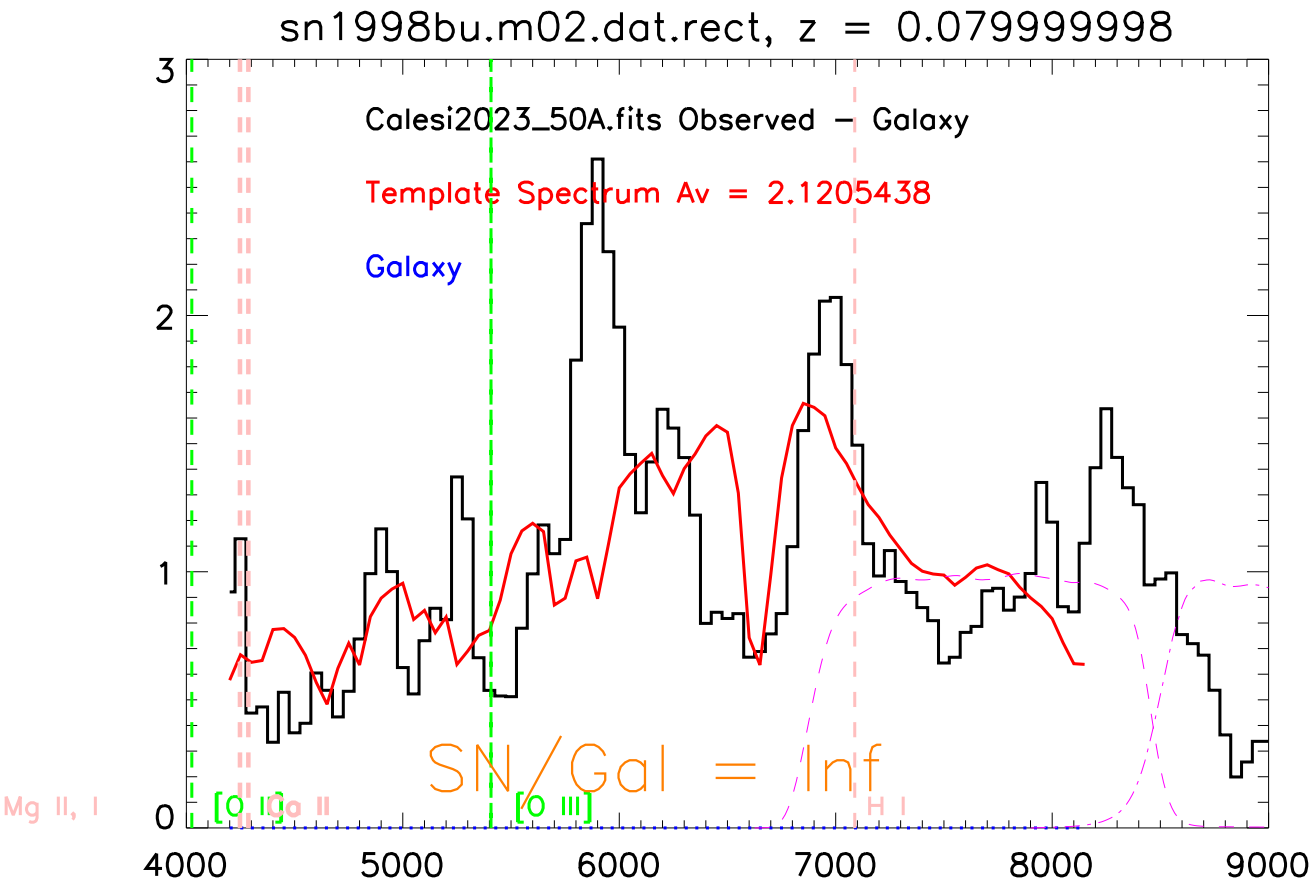
sn1998bu.m02.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.1205438
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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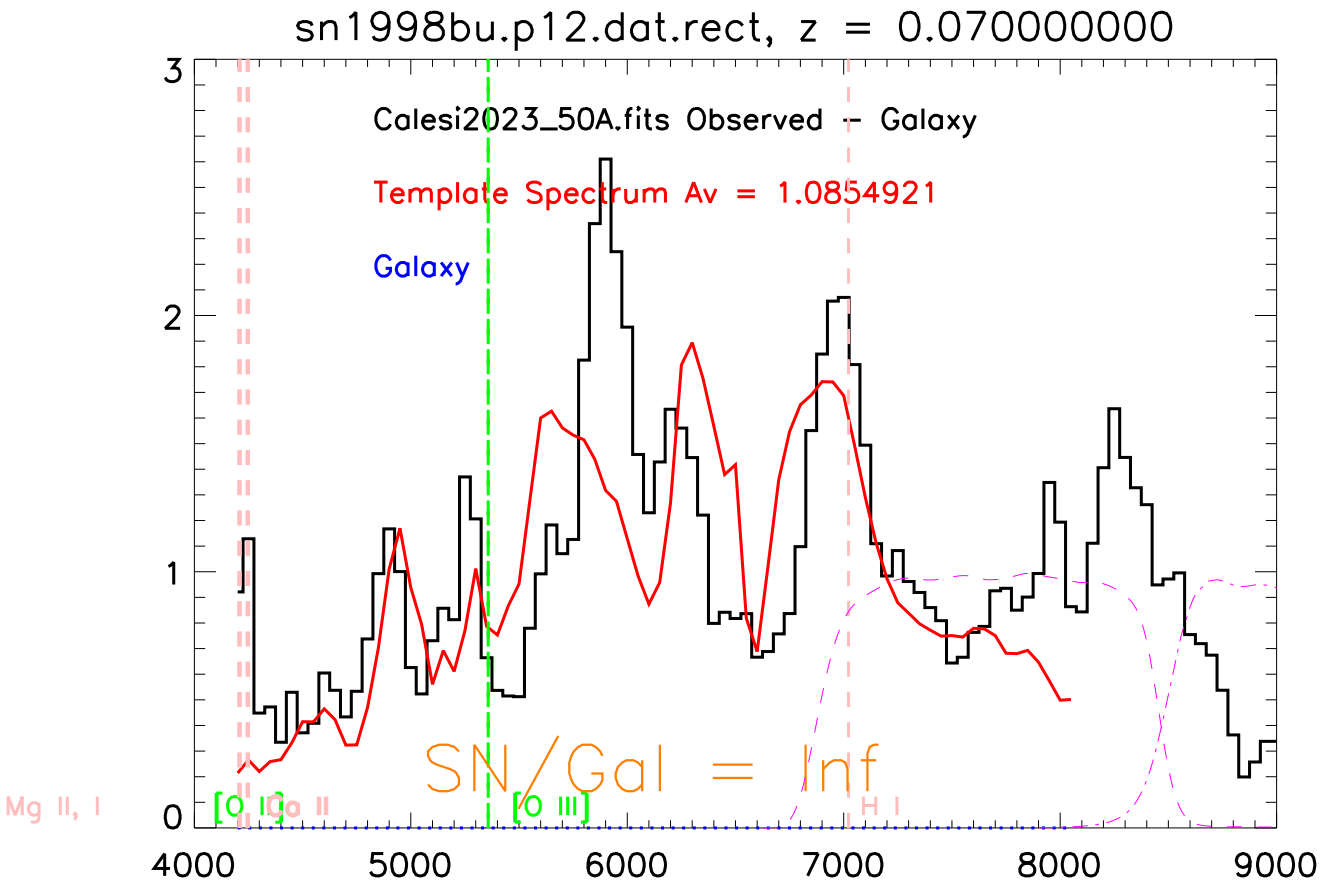
sn1998bu.p12.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.0854921
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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0
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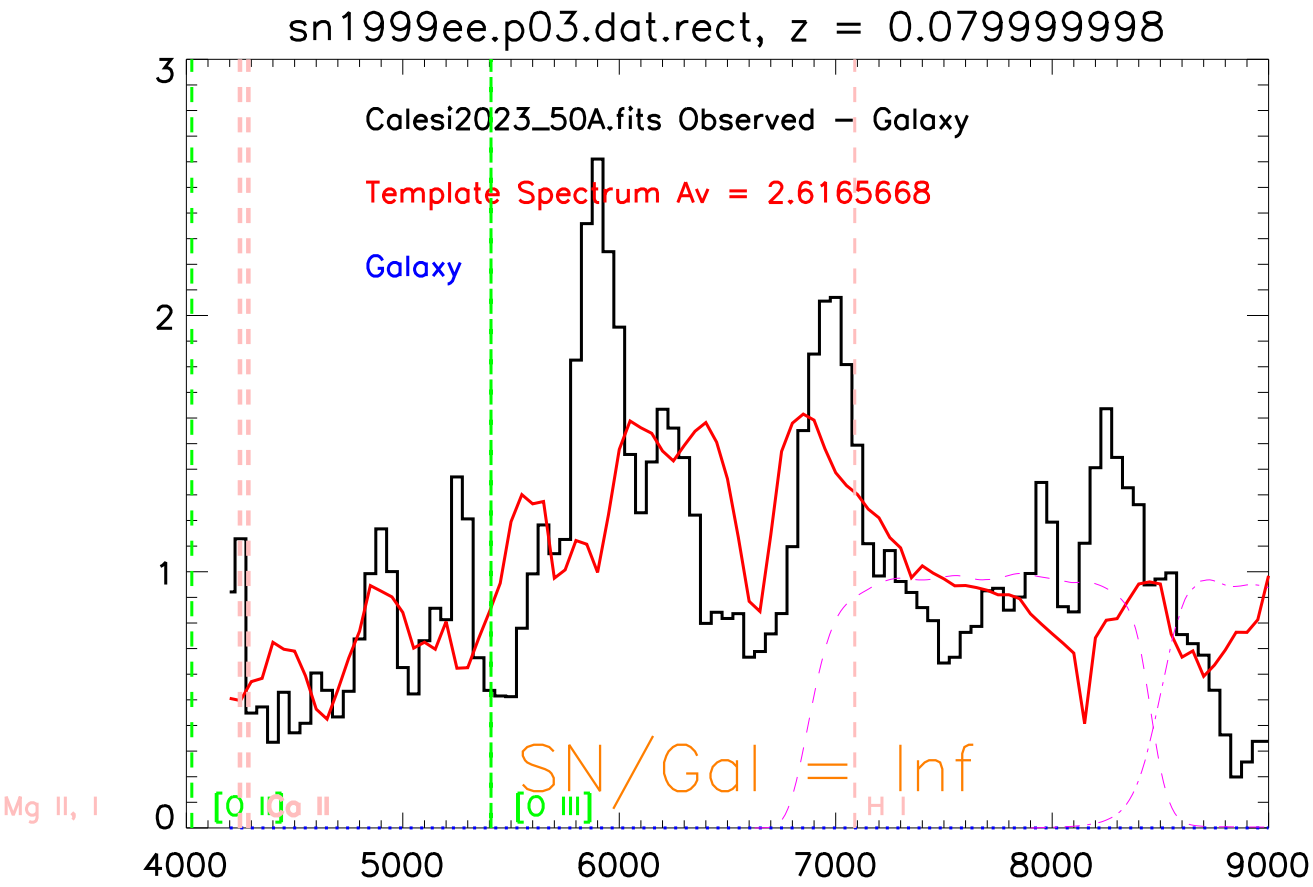
7000
8000
9000


sn1999ee.p03.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.6165668
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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2
3
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7000
8000
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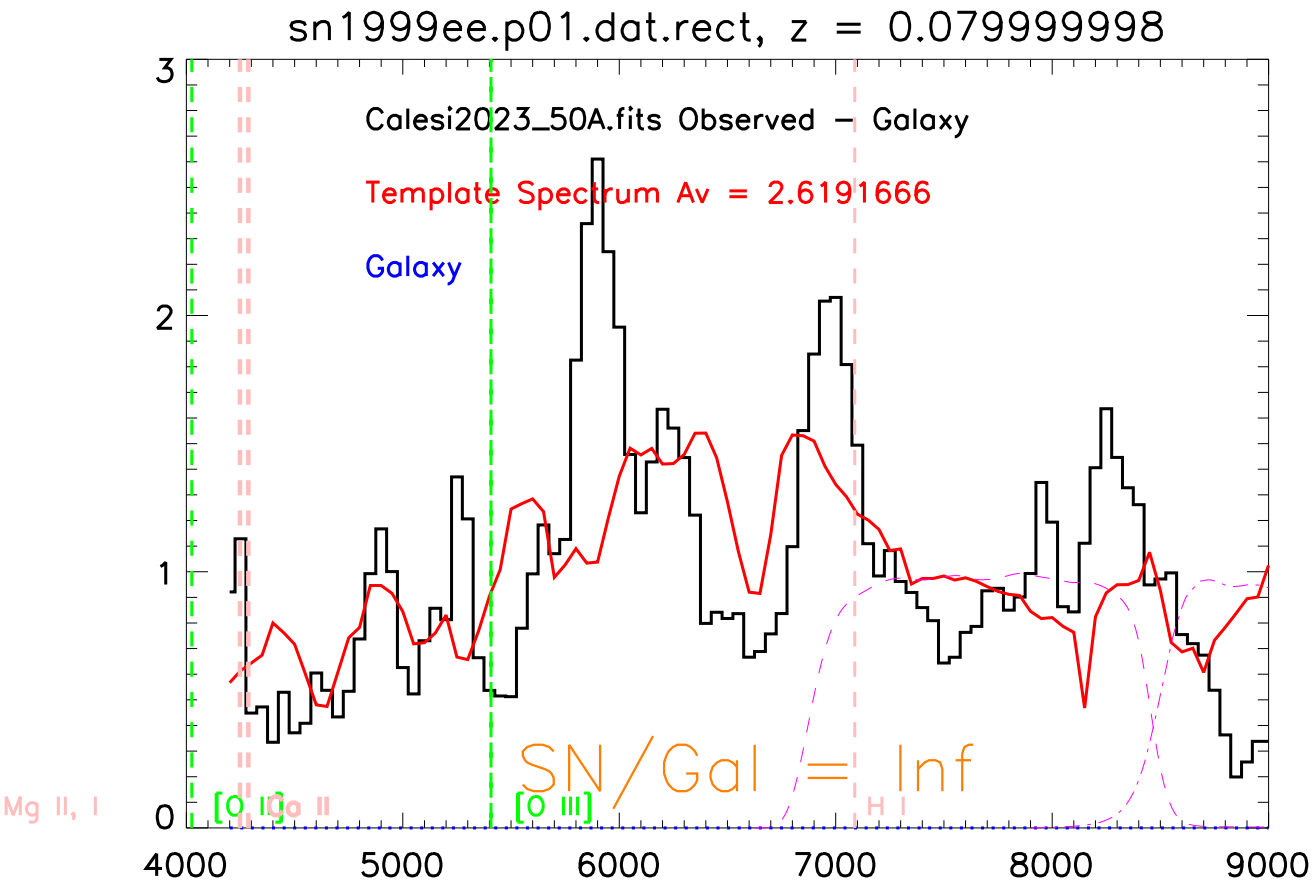
sn1999ee.p01.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.6191666
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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3
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8000
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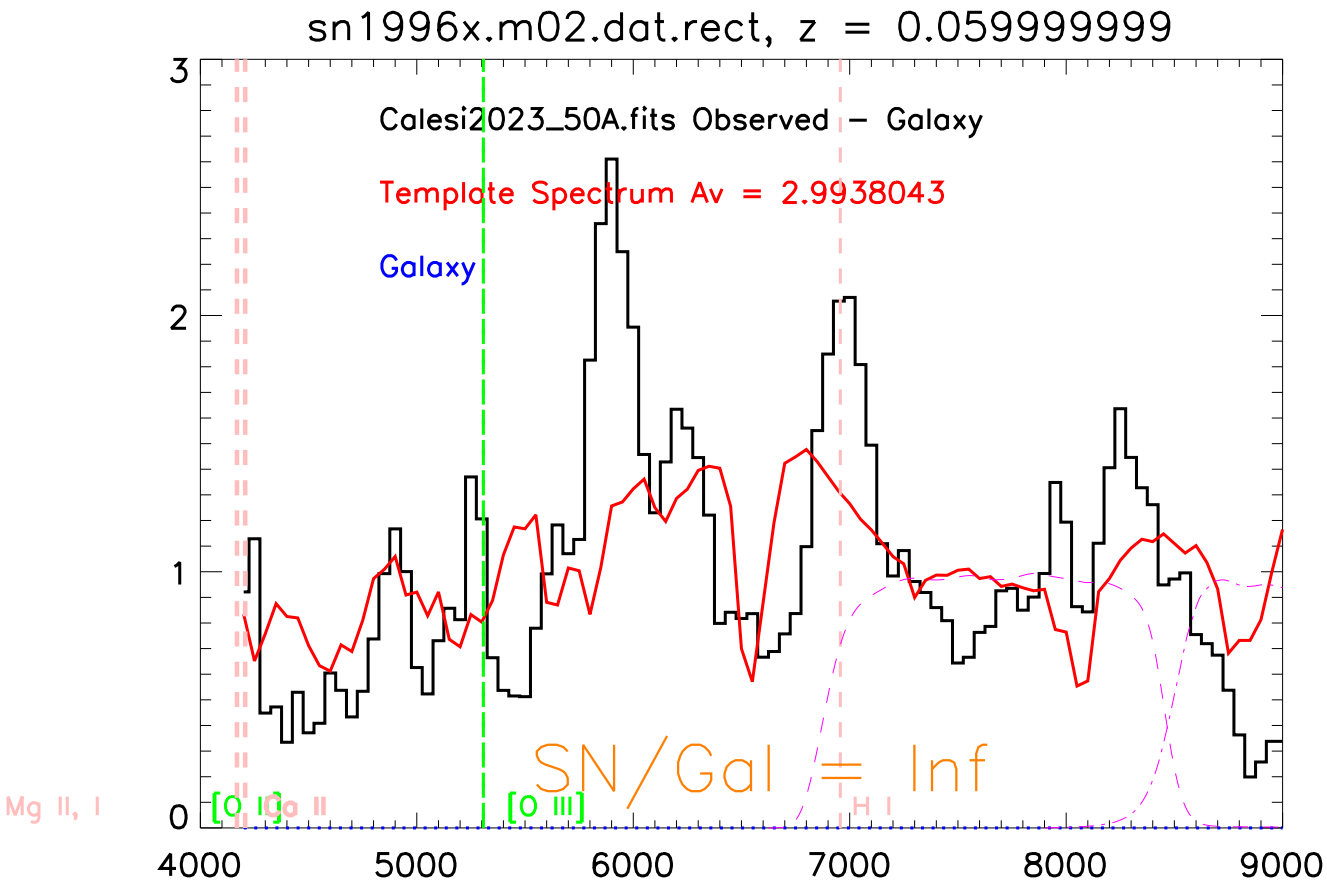
sn1996x.m02.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.9938043
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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8000
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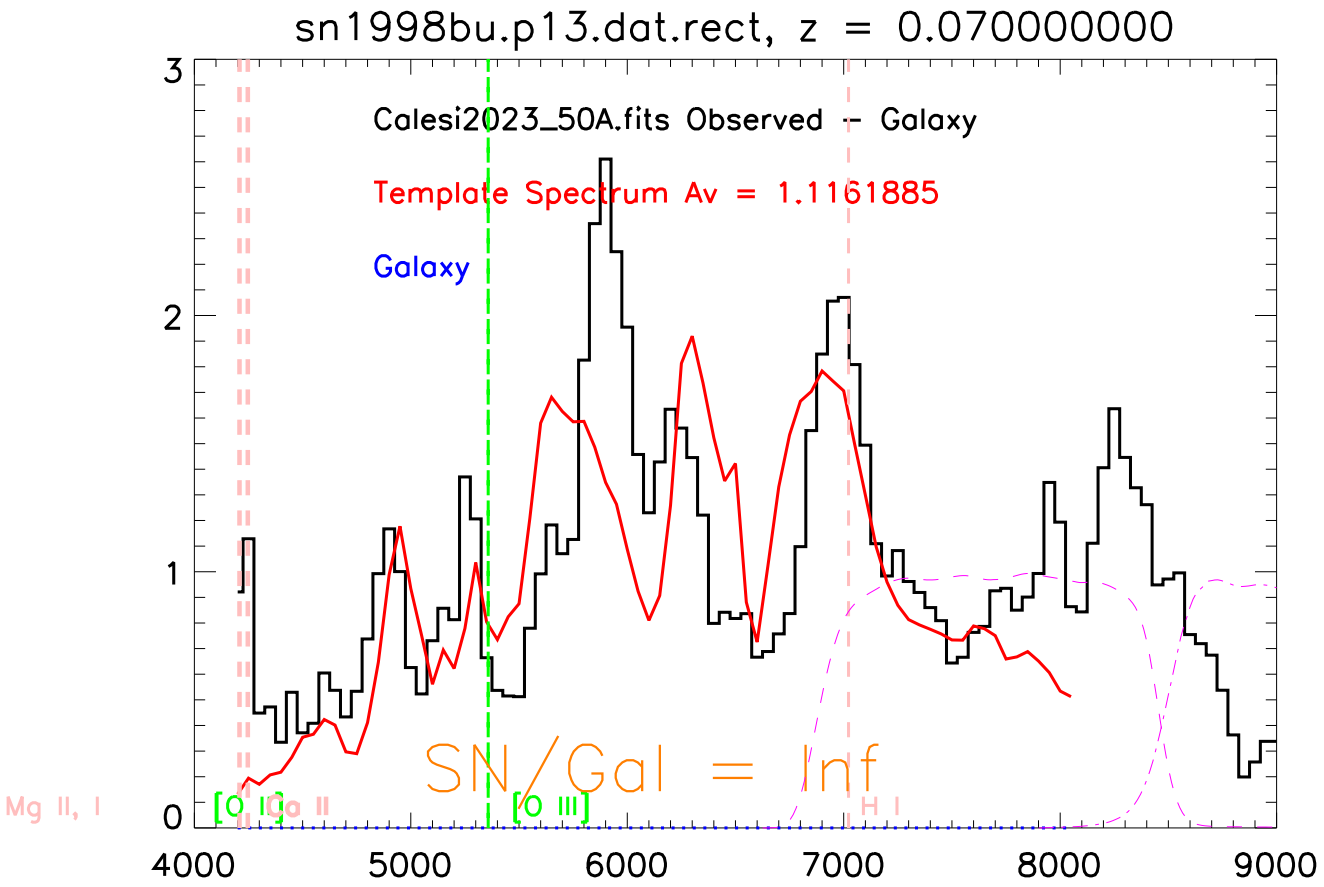
sn1998bu.p13.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.1161885
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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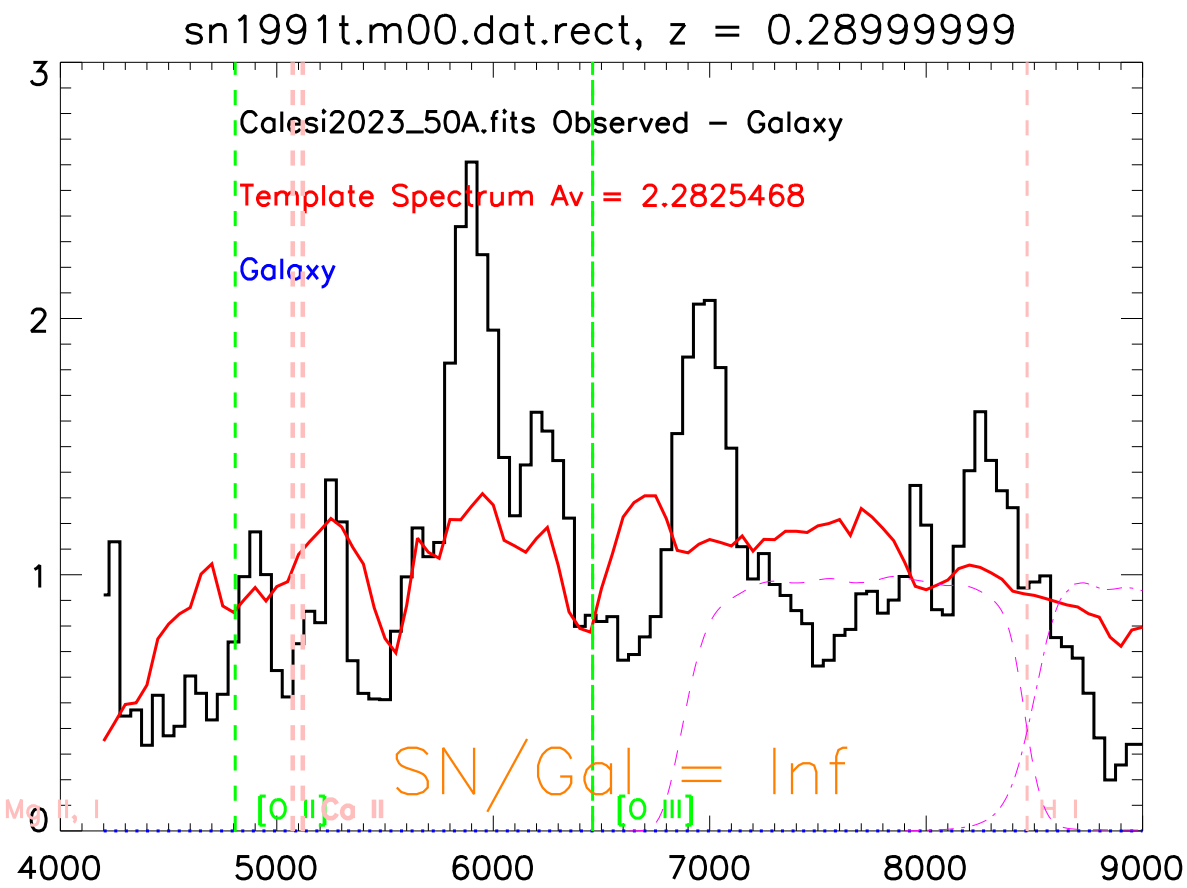
7000
8000
9000


sn1991t.m00.dat.rect, z = 0.28999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 2.2825468
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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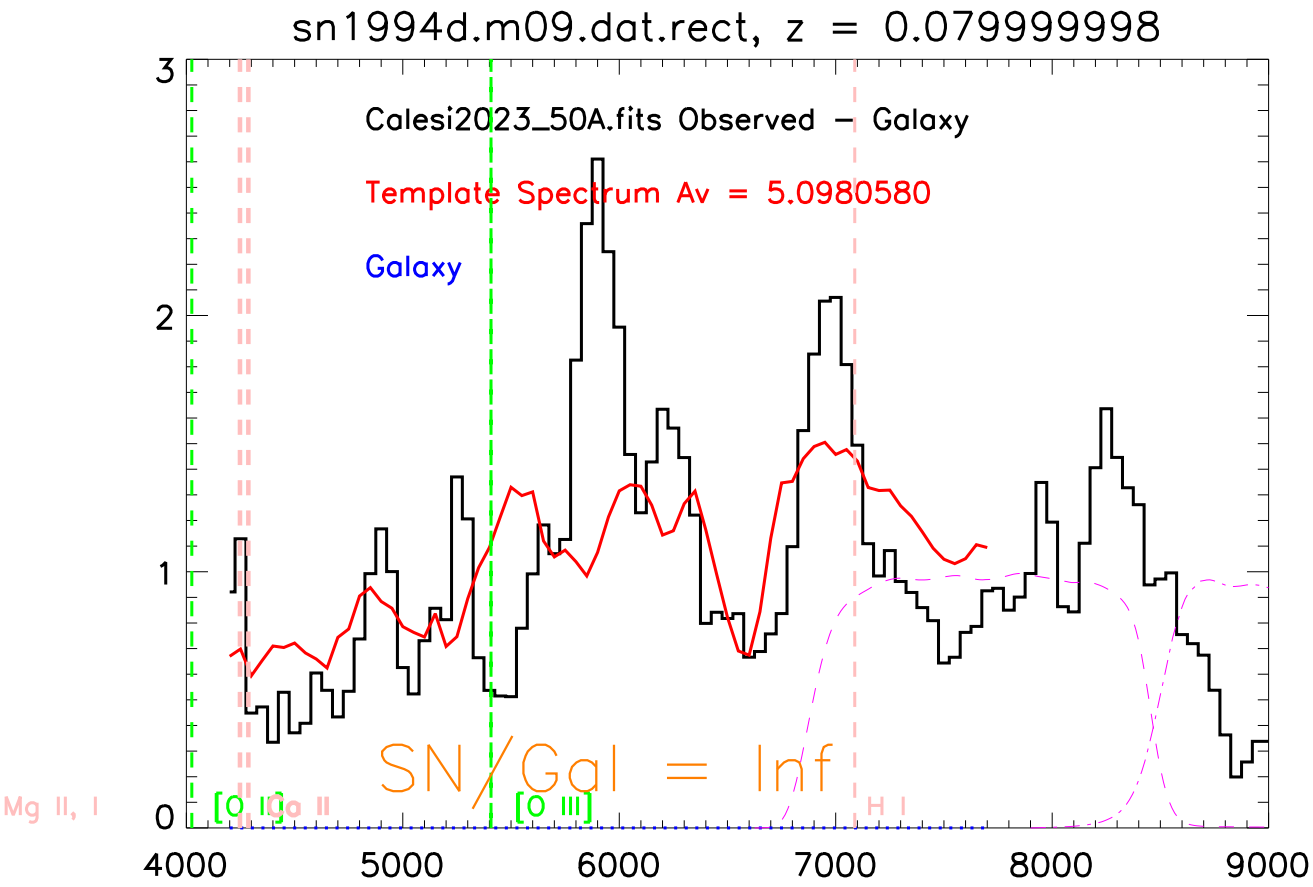
sn1994d.m09.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 5.0980580
Galaxy
SN/Gal = Inf
Mg II, I
[O I]
Ca II
[O III]
H I
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8000
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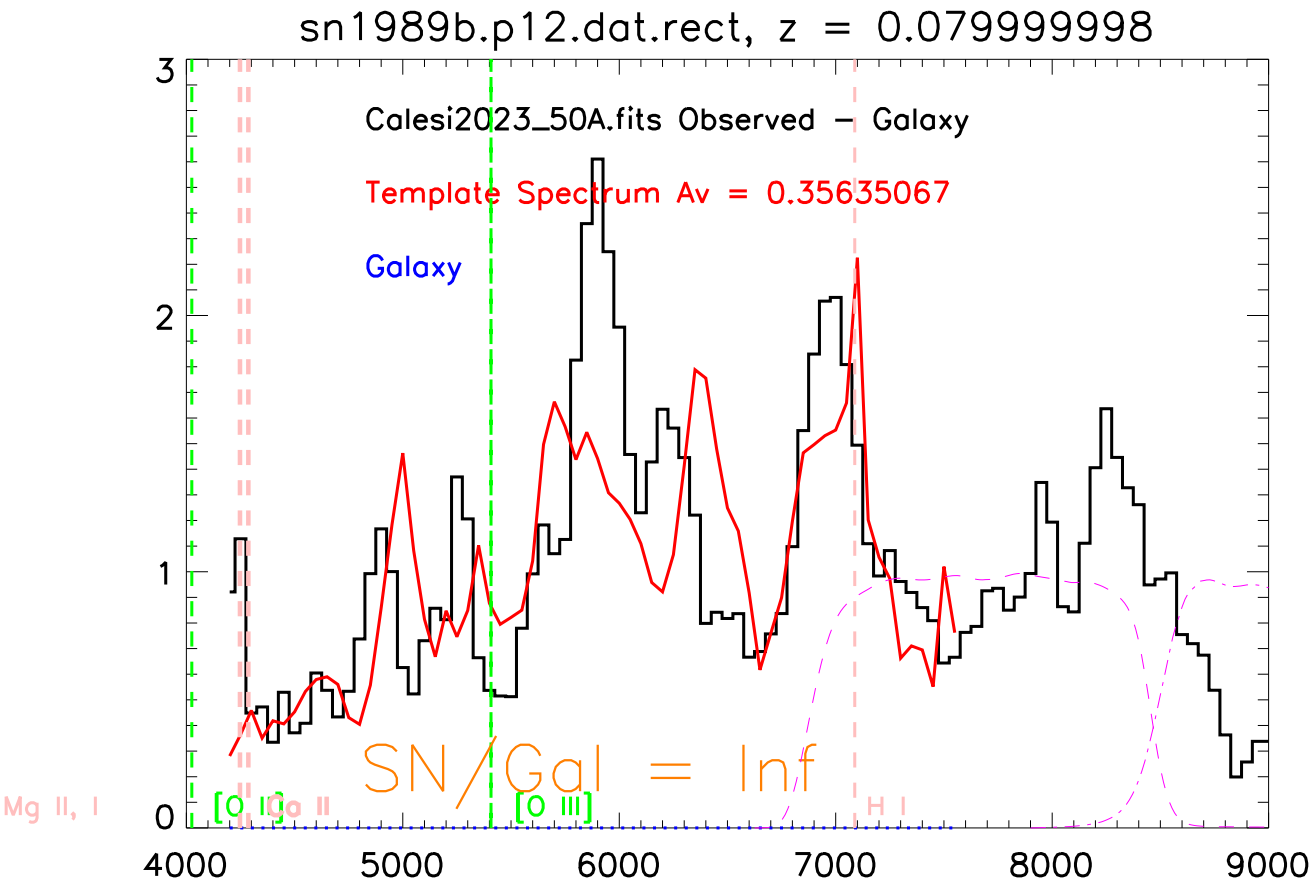
sn1989b.p12.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 0.35635067
Galaxy
SN/Gal = Inf
Mg II, I
[O I]
Ca II
[O III]
H I
0
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2
3
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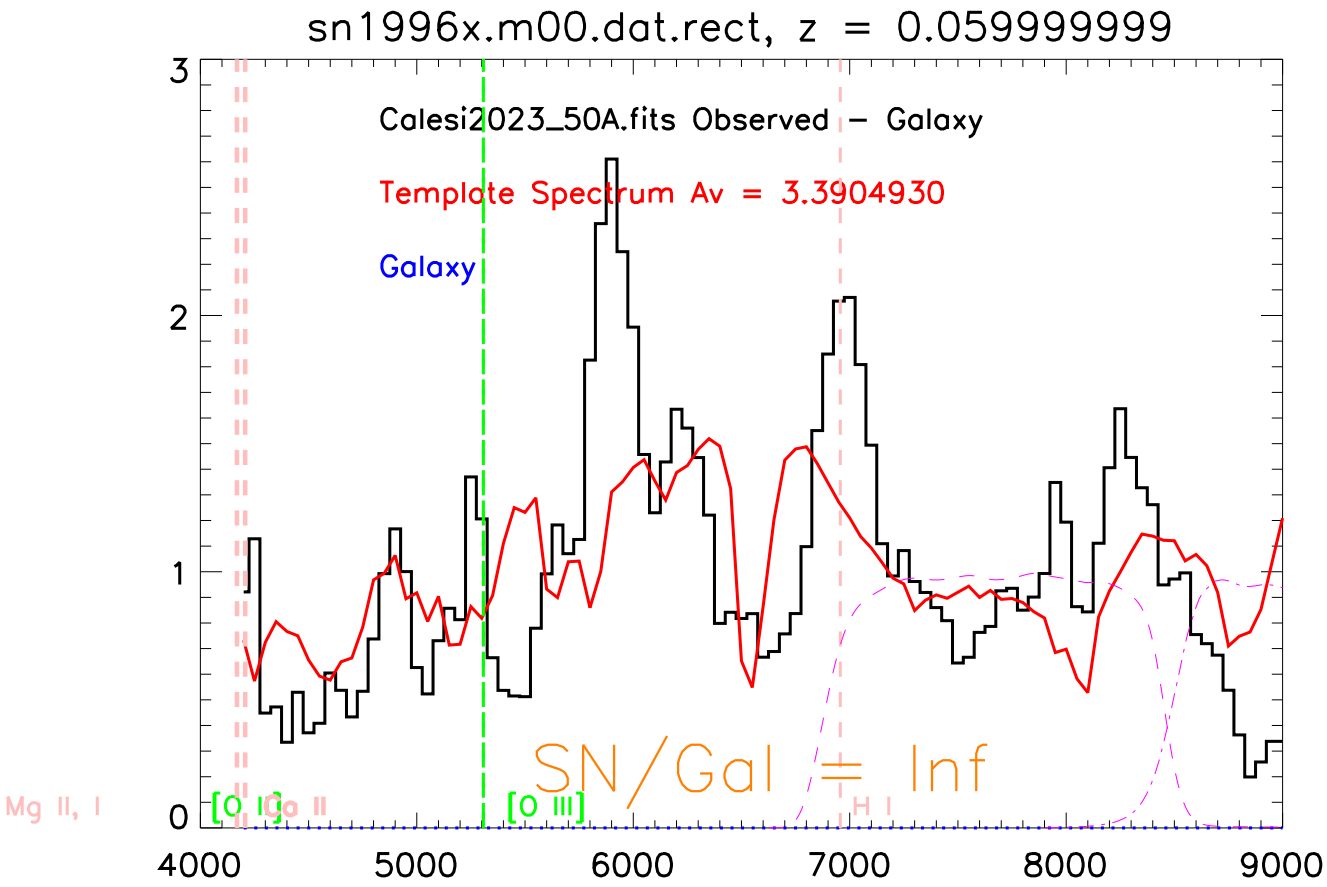
sn1996x.m00.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.3904930
Galaxy
SN/Gal = Inf
Mg II, I
[O II]
Ca II
[O III]
H I
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3
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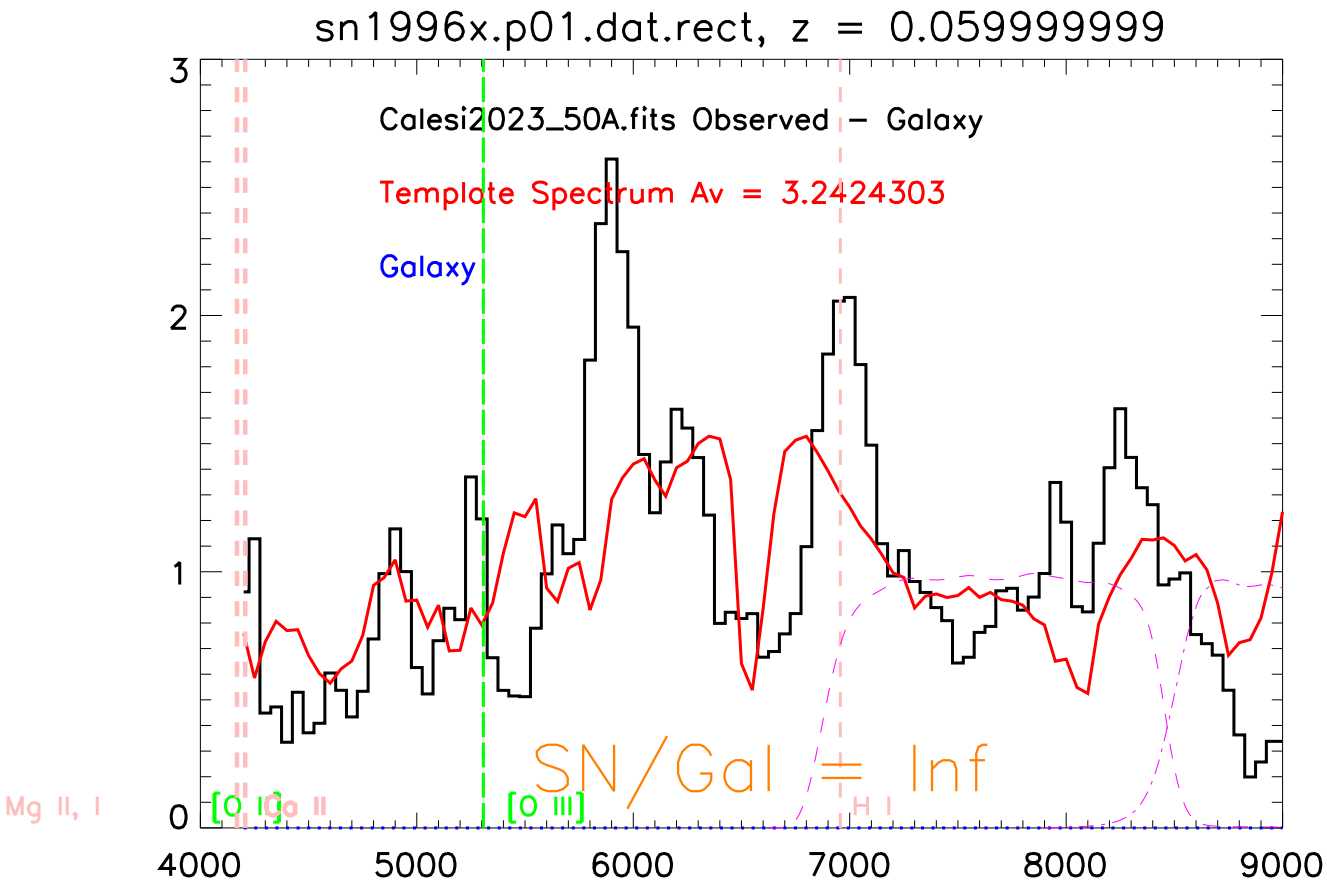
sn1996x.p01.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 3.2424303
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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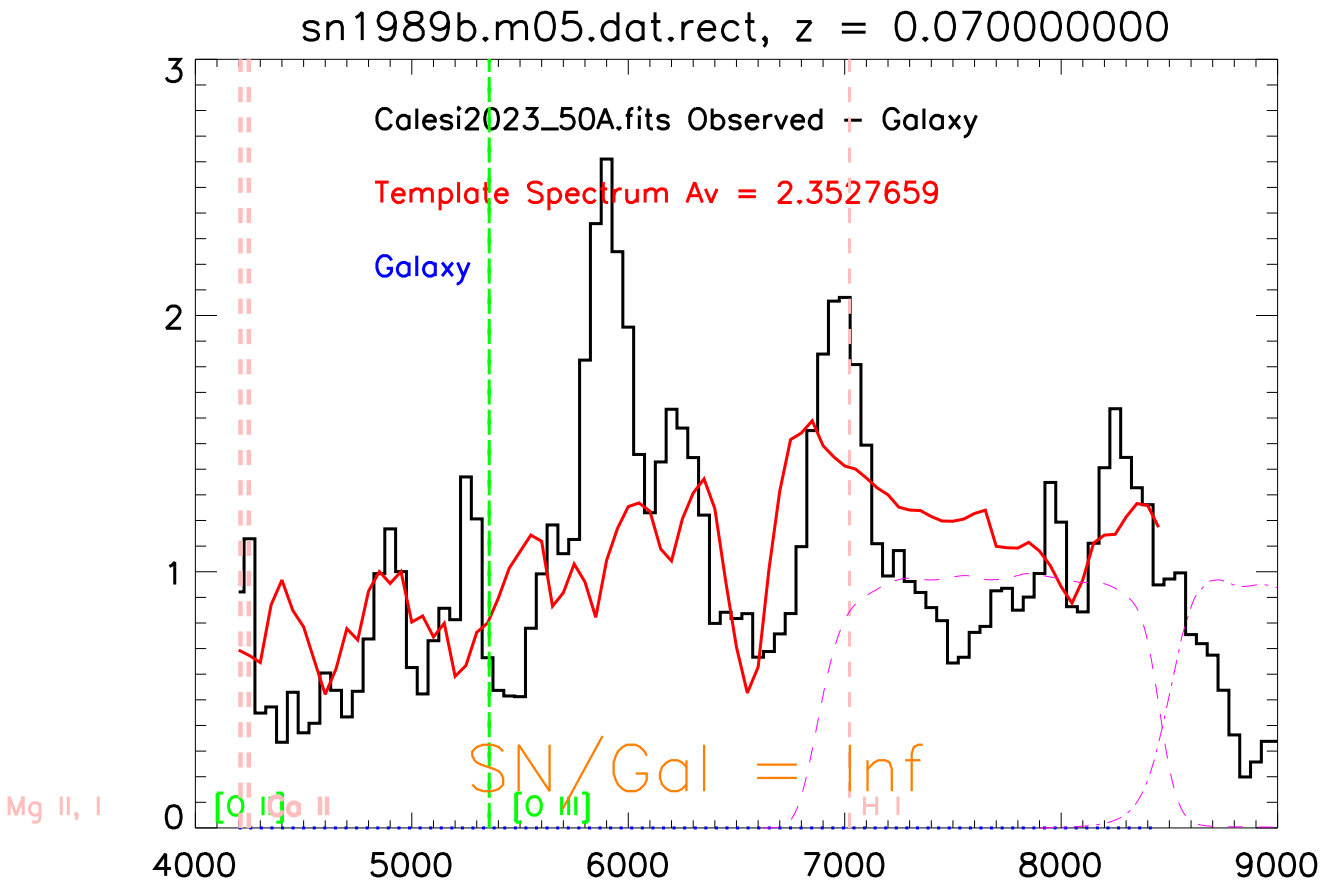
9000


sn1989b.m05.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 2.3527659
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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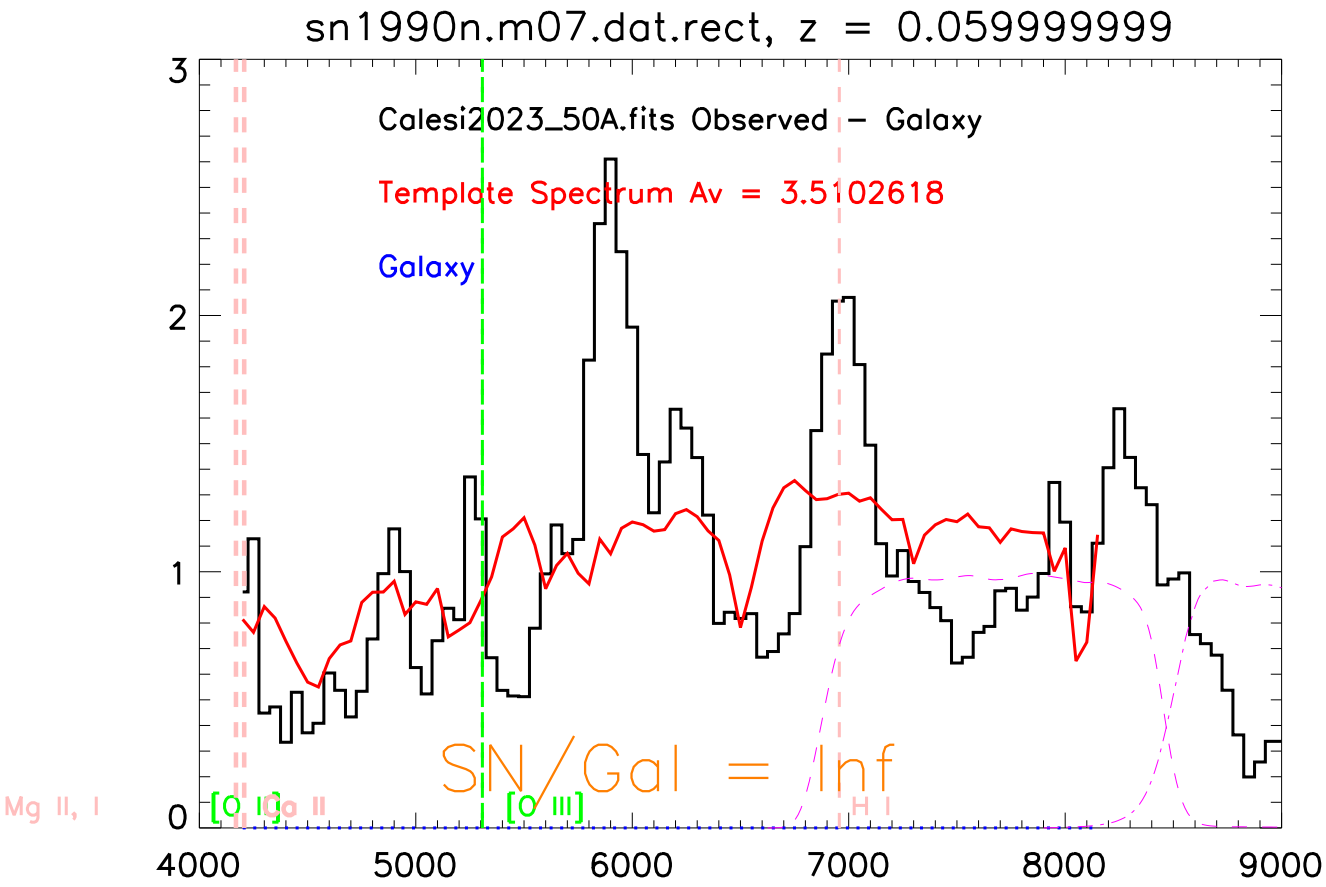
7000
8000
9000


sn1990n.m07.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.5102618
Galaxy
SN/Gal = Inf
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[O III]
H I
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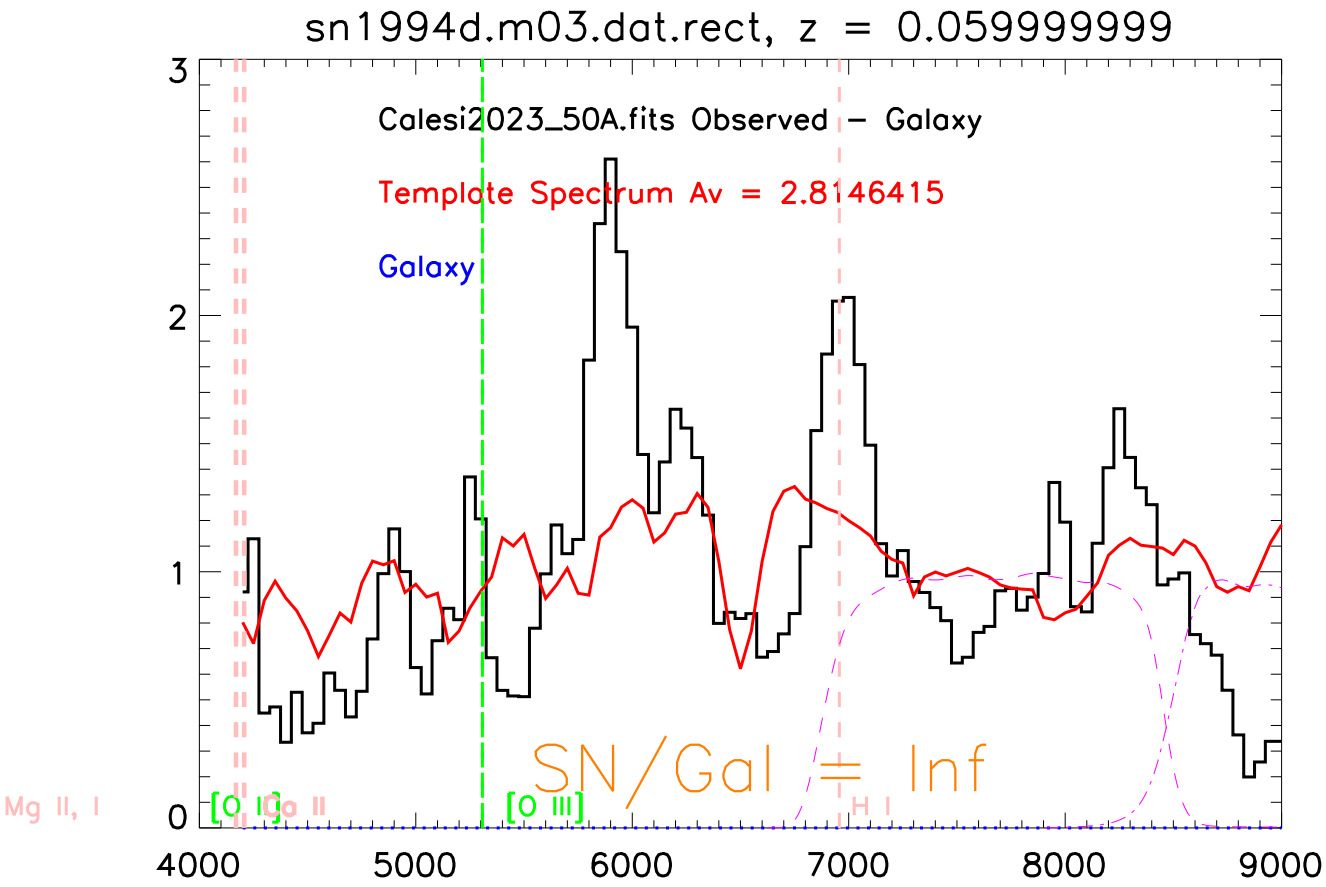
sn1994d.m03.dat.rect, z = 0.059999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 2.8146415
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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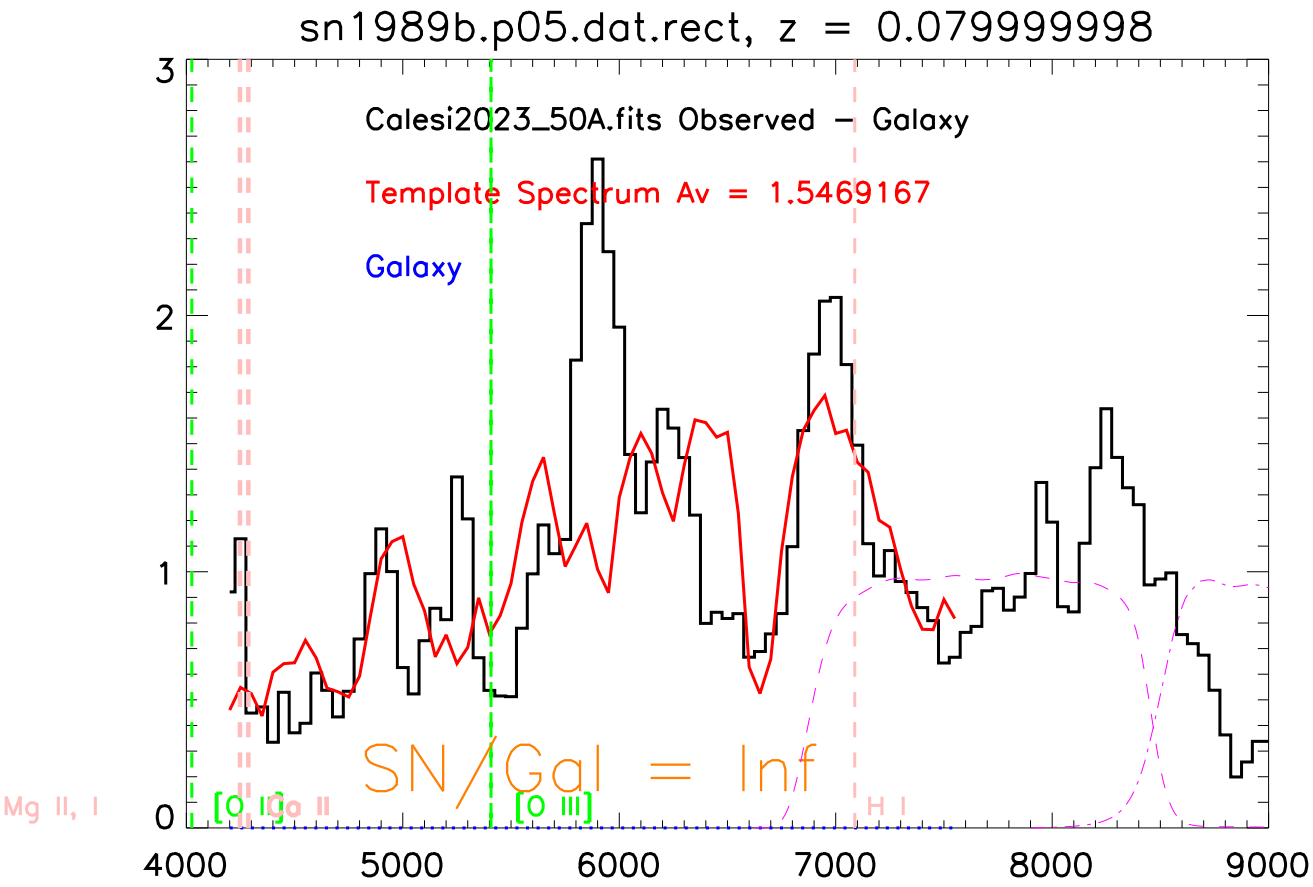
sn1989b.p05.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 1.5469167
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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2
3
4000
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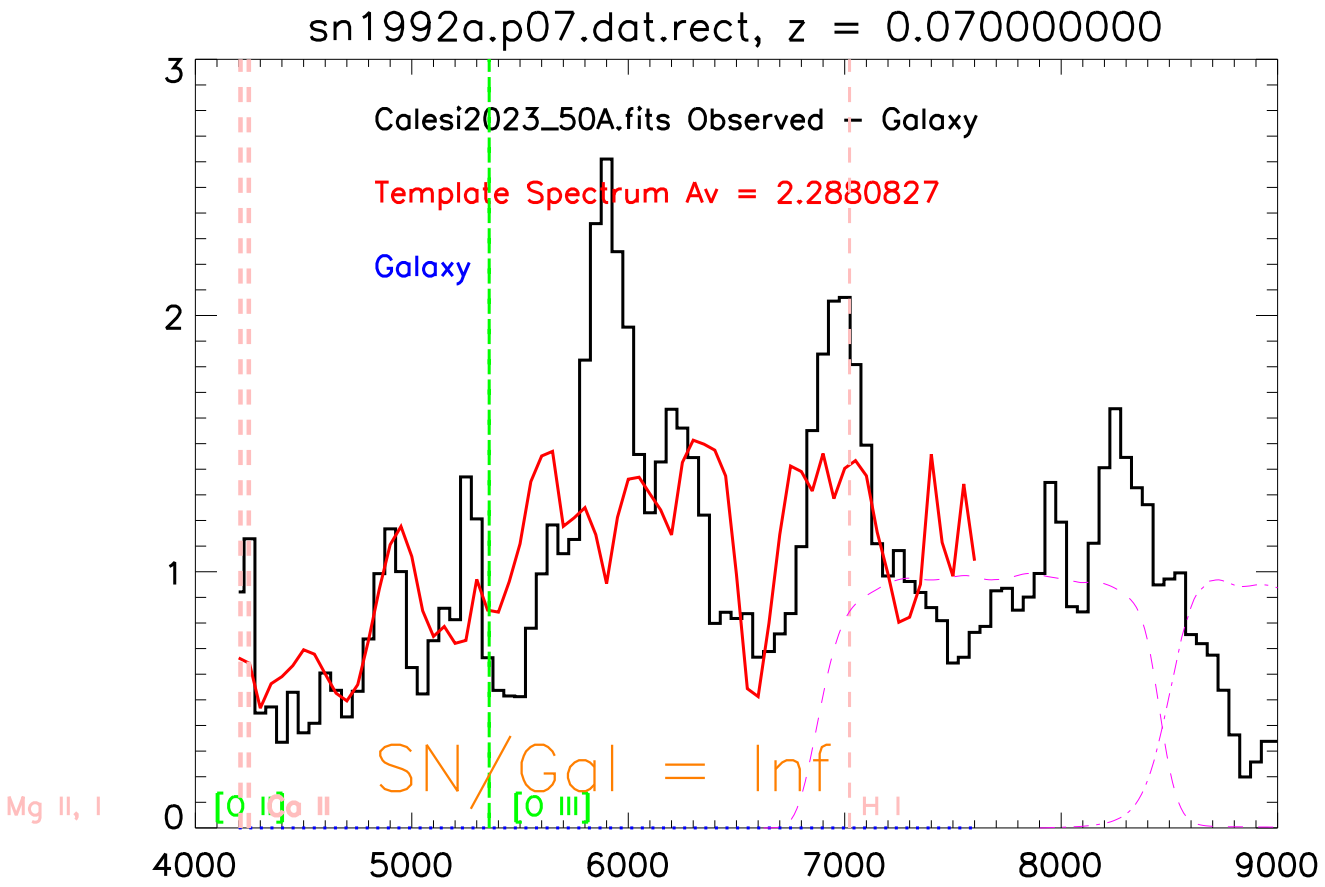
7000
8000
9000


sn1992a.p07.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 2.2880827
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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3
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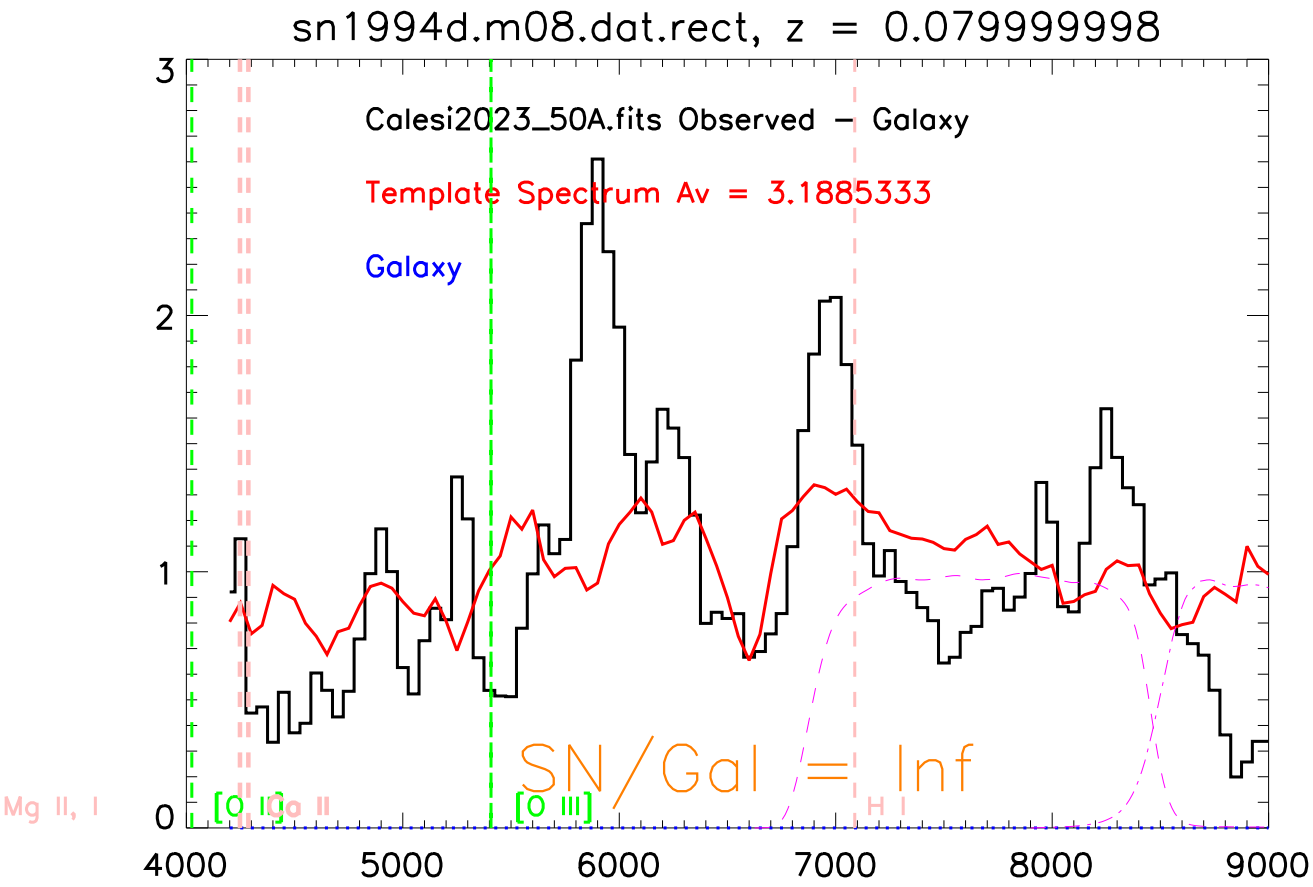
7000
8000
9000


sn1994d.m08.dat.rect, z = 0.079999998
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 3.1885333
Galaxy
SN/Gal = Inf
Mg II, I
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Ca II
[O III]
H I
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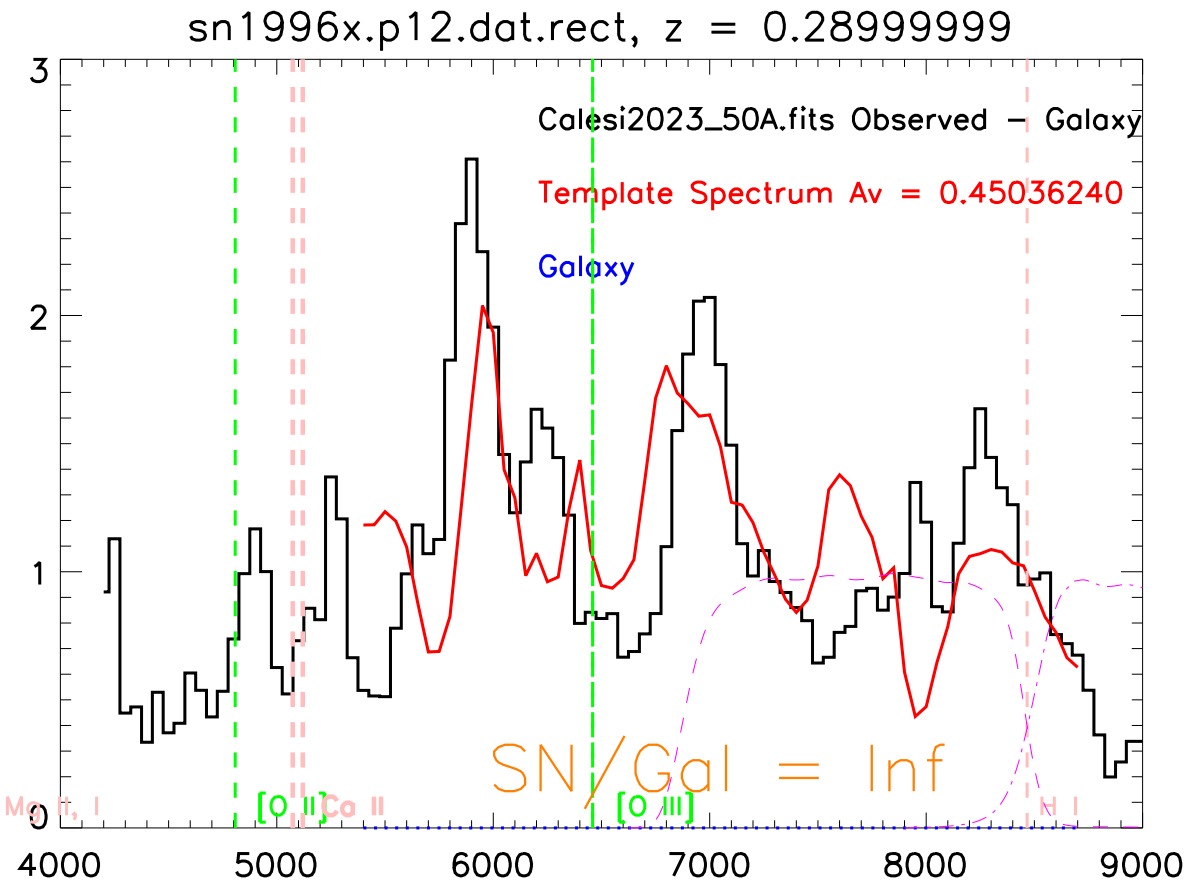
0
4000
5000
6000
7000
8000
9000


sn1996x.p12.dat.rect, z = 0.28999999
Calesi2023_50A.fits Observed – Galaxy
Template Spectrum Av = 0.45036240
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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1
0
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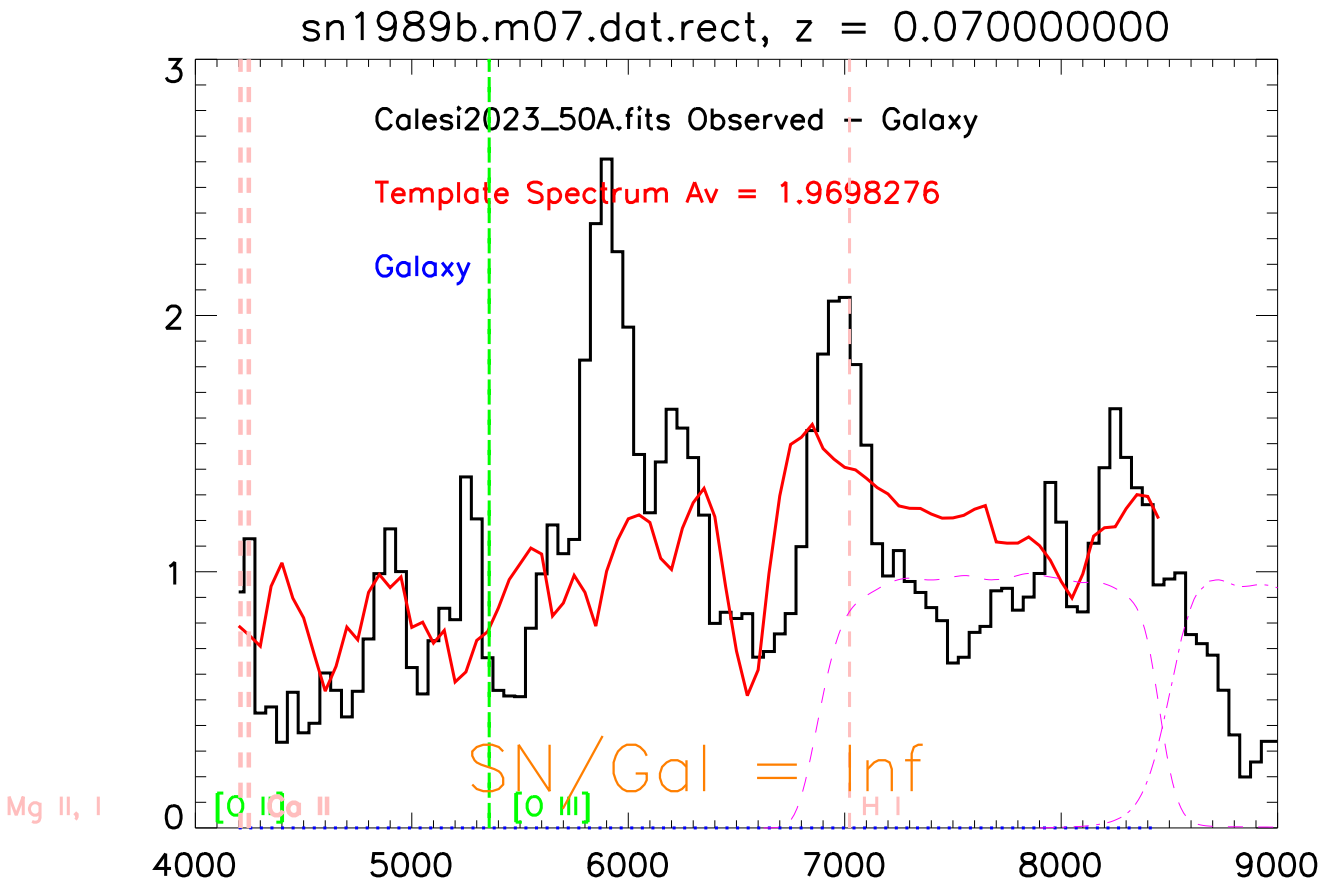
7000
8000
9000


sn1989b.m07.dat.rect, z = 0.070000000
Calesi2023_50A.fits Observed - Galaxy
Template Spectrum Av = 1.9698276
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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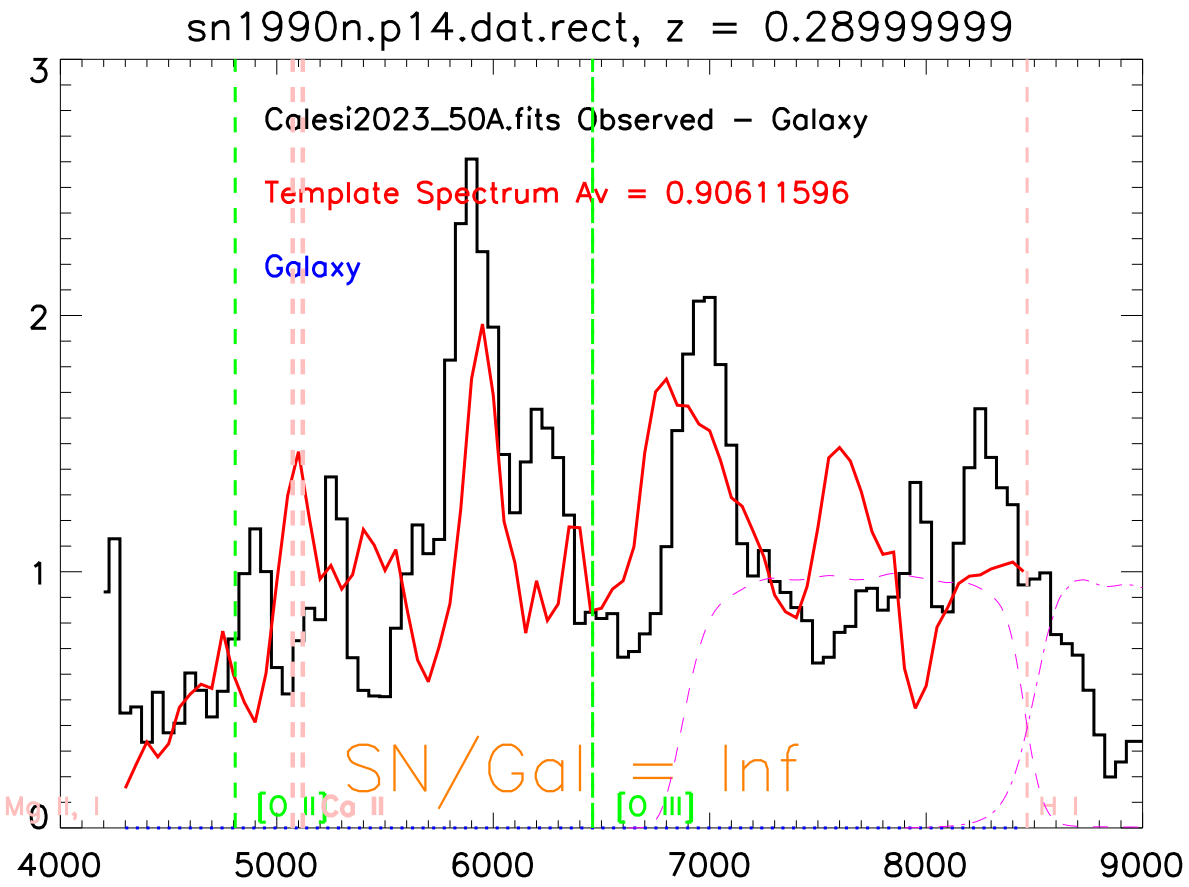
sn1990n.p14.dat.rect, z = 0.28999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 0.90611596
Galaxy
SN/Gal = Inf
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Ca II
[O III]
H I
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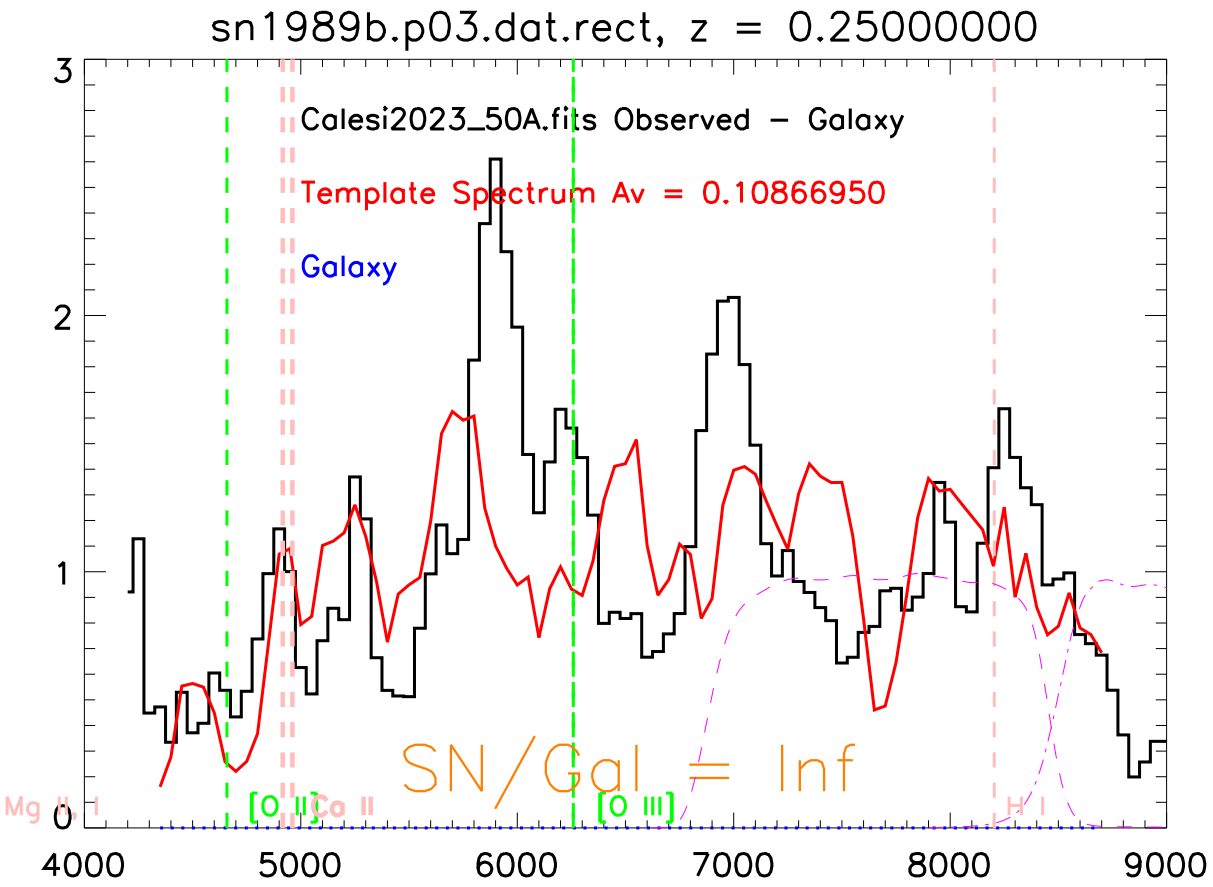
7000
8000
9000


sn1989b.p03.dat.rect, z = 0.25000000
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 0.10866950
Galaxy
SN/Gal = Inf
Mg II
[O II]
Ca II
[O III]
H I
0
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2
3
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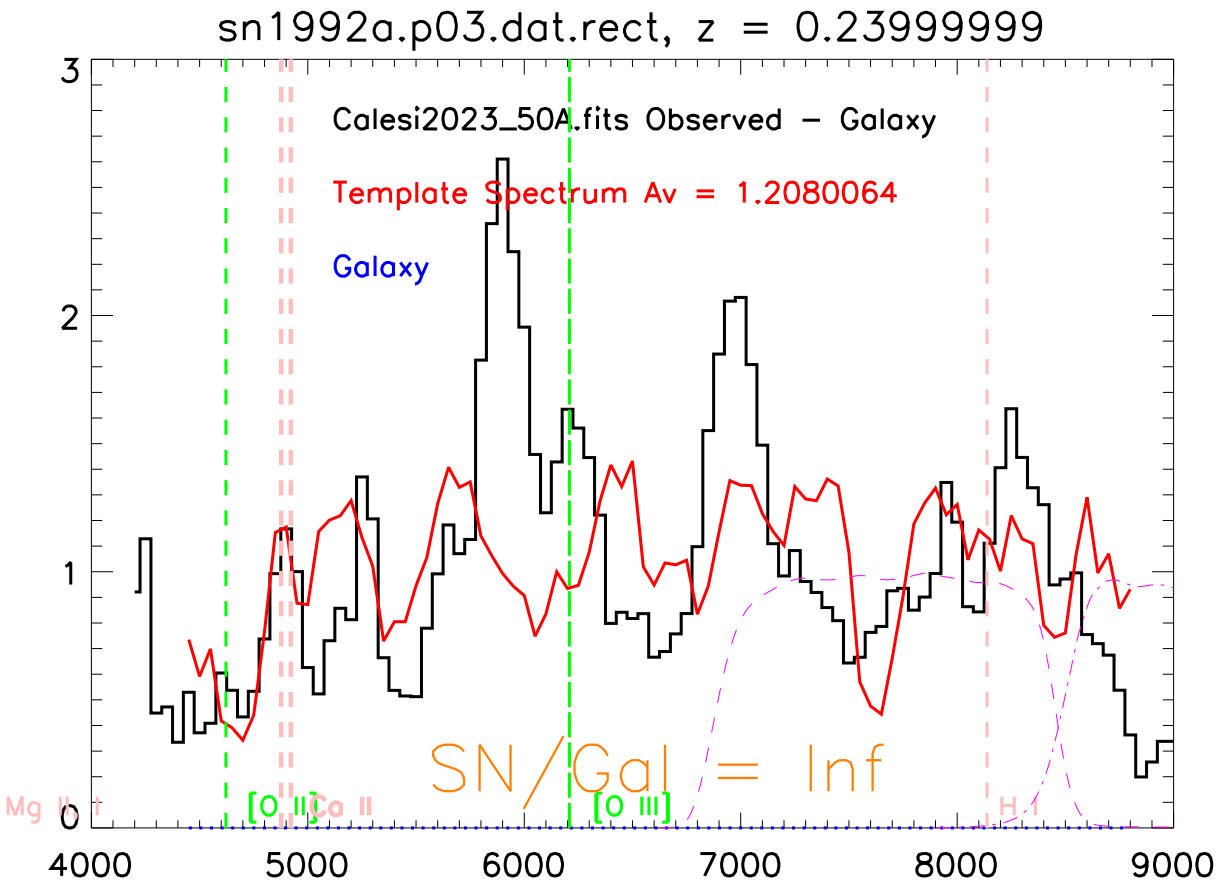
7000
8000
9000


sn1992a.p03.dat.rect, z = 0.23999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 1.2080064
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H-1
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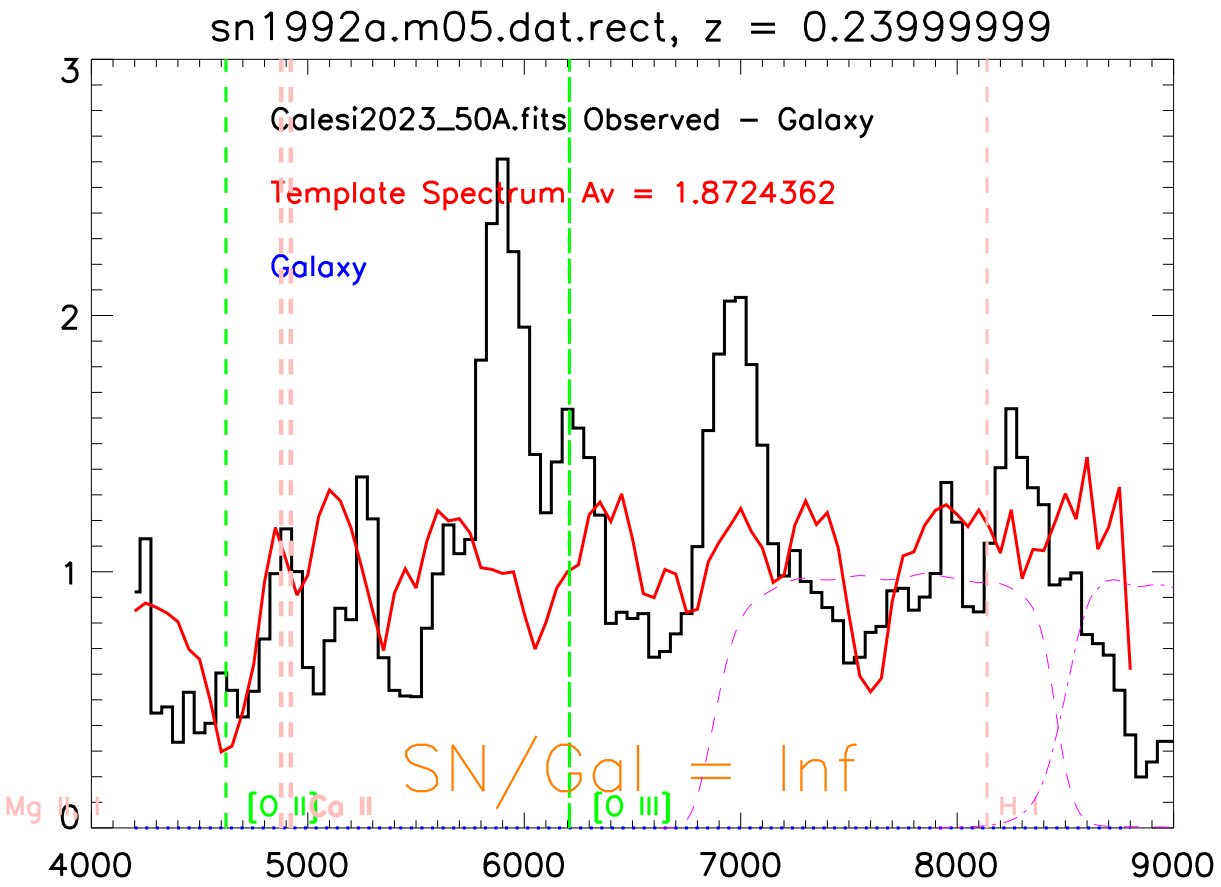
7000
8000
9000


sn1992a.m05.dat.rect, z = 0.23999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 1.8724362
Galaxy
SN/Gal = Inf
Mg II
[O II]
Ca II
[O III]
H 1
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1
0
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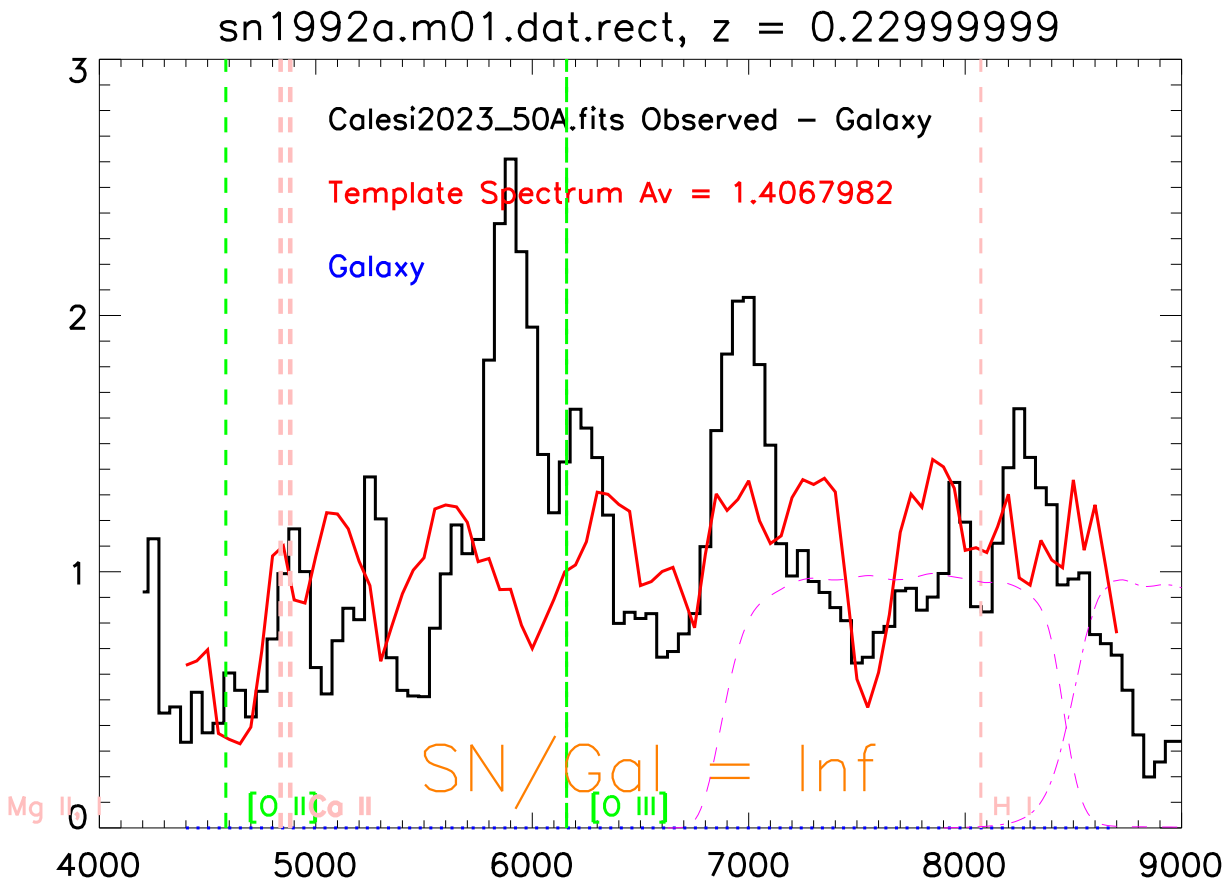
9000


sn1992a.m01.dat.rect, z = 0.22999999
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = 1.4067982
Galaxy
SN/Gal = Inf
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[O II]
Ca II
[O III]
H I
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8000
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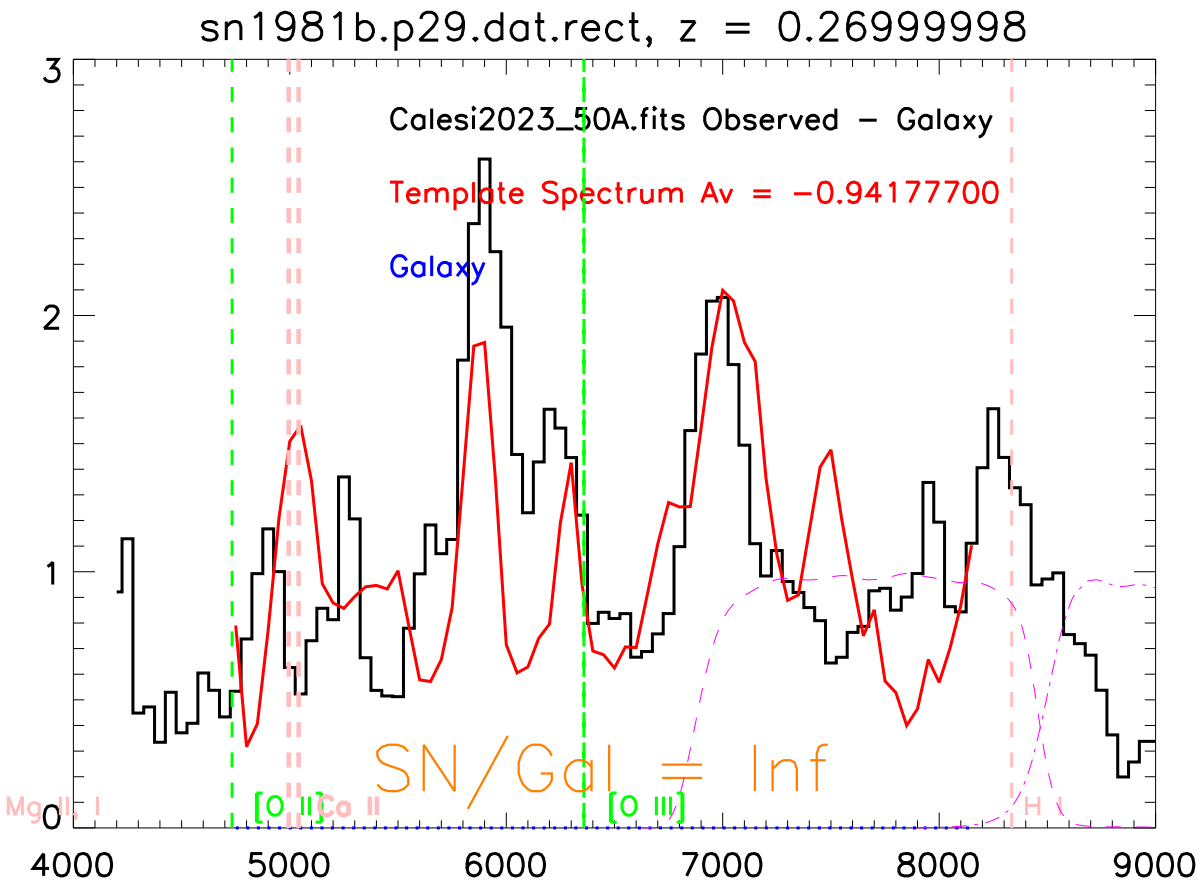
sn1981b.p29.dat.rect, z = 0.26999998
Calesi2023_50A.fits Observed − Galaxy
Template Spectrum Av = −0.94177700
Galaxy
SN/Gal = Inf
[O II]
Ca II
[O III]
3
2
1
0
4000
5000
6000
7000
8000
9000