test_modele_dynamique

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In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

1 setting up experimental protocol

In [2]:
```
from parametres import sliders, VPs, volume, p, kinects_network_config, d_x, d_y, d_z,
from modele_dynamique import Scenario, xyz2azel
events = [0, 0, 0, 0, 0, 0, 0, 0] # 8 types d'événéments
print p['N'], VPs
```

```
DEBUG parametres , position croix:  [ 10.85000038   5.19000006
1.36000001]
32 [{'cz': 1.36, 'cy': 5.19, 'cx': 10.85, 'pc_min': 0.001, 'address':
'10.42.0.55', 'y': 1.69, 'x': 0.55, 'pc_max': 1000000.0, 'z': 1.36,
'foc': 21.802535306060136}, {'cz': 1.36, 'cy': 5.19, 'cx': 10.85,
'pc_min': 0.001, 'address': '10.42.0.56', 'y': 5.19, 'x': 0.55,
'pc_max': 1000000.0, 'z': 1.36, 'foc': 21.802535306060136}, {'cz':
1.36, 'cy': 5.19, 'cx': 10.85, 'pc_min': 0.001, 'address':
'10.42.0.51', 'y': 8.69, 'x': 0.55, 'pc_max': 1000000.0, 'z': 1.36,
'foc': 21.802535306060136}]
```

In [3]:
```
def simulpos(s, t, players):
    positions = []
    for player in players:
        positions.append([player['center'][0] + player['amp'][0]*np.cos(2*np.pi*t/play
                          player['center'][1] + player['amp'][1]*np.cos(2*np.pi*t/play
                          player['center'][2] + player['amp'][2]*np.cos(2*np.pi*t/play
    return positions
```

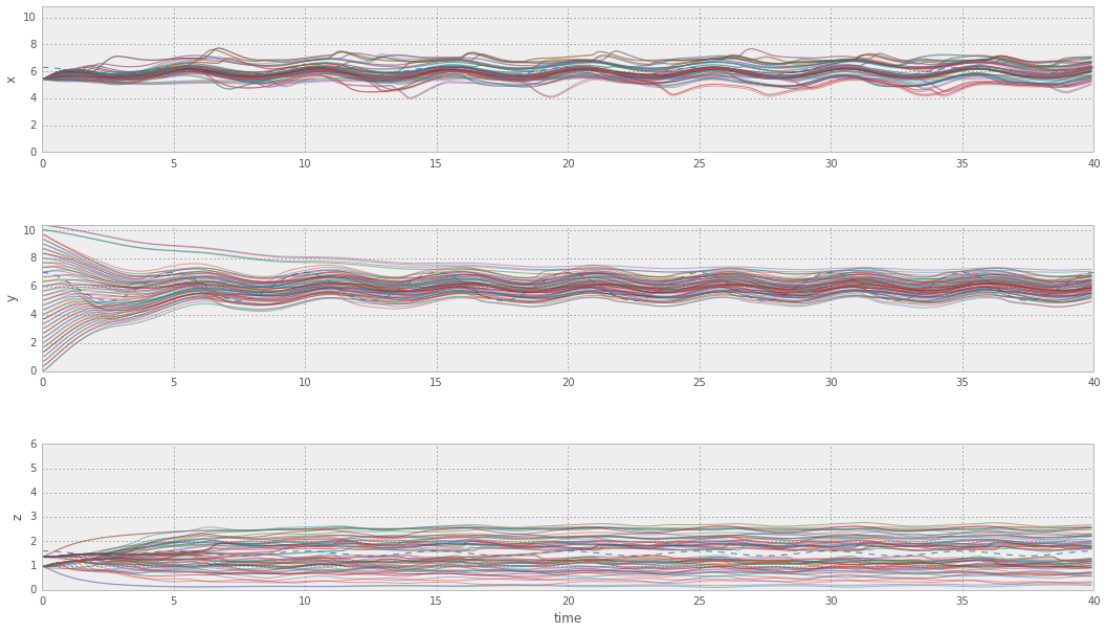
In [4]:
```
def simul(p, players, dt=.01, t_stop=40., s_VP = 1,
          display=True, polar=False, N_step=400, limit=True):
    time = np.arange(0., t_stop, dt)
    N_time = len(time)
    n_players = len(players)
    positions_ = np.zeros((3, n_players, N_time))
    particles = np.zeros((12, p['N'], N_time))
    s = Scenario(p['N'], scenario, volume, [VPs[s_VP]], p, calibration)
    for i_t, t in enumerate(time):
        positions = simulpos(s, t, players)
        positions_[:, :, i_t] = np.array(positions).T
        s.do_scenario(positions=positions, events=events, dt=dt)
        particles[:, :, i_t] = s.particles#[0:6, :]#s_VP*s.N:(s_VP+1)*s.N]
    if display:
        fig = plt.figure(figsize=(18,10))
        T_step = max(int(N_time / N_step), 1)
```

```
        if polar:
            rae_PC = xyz2azel(positions_, np.array([VPs[s_VP]['x'],
                                                    VPs[s_VP]['y'],
                                                    VPs[s_VP]['z']]))
            rae_VC = xyz2azel(particles[:3, :, :], np.array([VPs[s_VP]['x'],
                                                    VPs[s_VP]['y'],
                                                    VPs[s_VP]['z']]))
            for i_ax, axe in zip(range(3), ['r', 'a', 'e']):
                ax = fig.add_subplot(3, 1, 1+ i_ax)
                ax.plot(time, rae_PC[i_ax, :, :].T, '--')
                ax.plot(time[::T_step], rae_VC[i_ax, :, ::T_step].T, alpha=.5)
                #ax.errorbar(time[::T_step], particles[i_ax, :, ::T_step].mean(axis=0)
                #ax.errorbar(time[::T_step], particles[i_ax + 3, :, ::T_step].mean(axi
                ax.set_ylabel(axe)
        else:
            for i_ax, axe, d in zip(range(3), ['x', 'y', 'z'], [d_x, d_y, d_z]):
                ax = fig.add_subplot(3, 1, 1+ i_ax)
                ax.plot(time, positions_[i_ax, :, :].T, '--')
                ax.plot(time[::T_step], particles[i_ax, :, ::T_step].T, alpha=.5)
                ax.plot(time[::T_step], particles[i_ax + 3, :, ::T_step].T, alpha=.5)
                #ax.errorbar(time[::T_step], particles[i_ax, :, ::T_step].mean(axis=0)
                #ax.errorbar(time[::T_step], particles[i_ax + 3, :, ::T_step].mean(axi
                ax.set_ylabel(axe)
                ax.set_ylim([0., d])
        ax.set_xlabel('time')
    return positions_, particles
```

2 stabilité avec paramètres

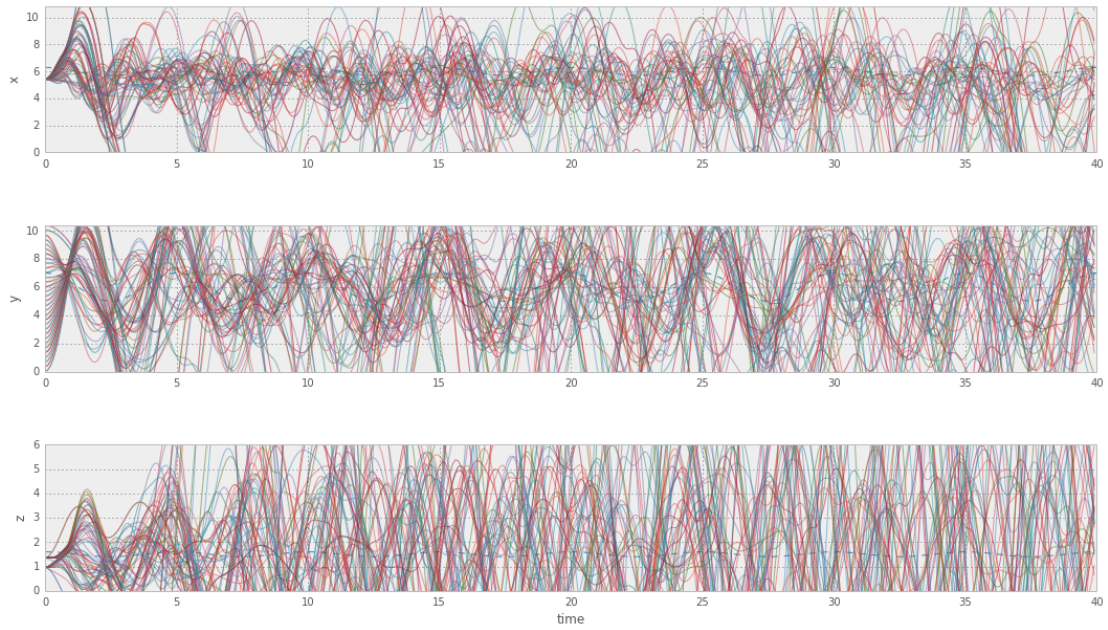
In [5]:
```
players = [{'center': [6., 6, 1.5], 'amp': [.3,1.,.1] , 'T': 5.}]
print p['damp']
pos, particles = simul(p, players)
```

```
0.1
```

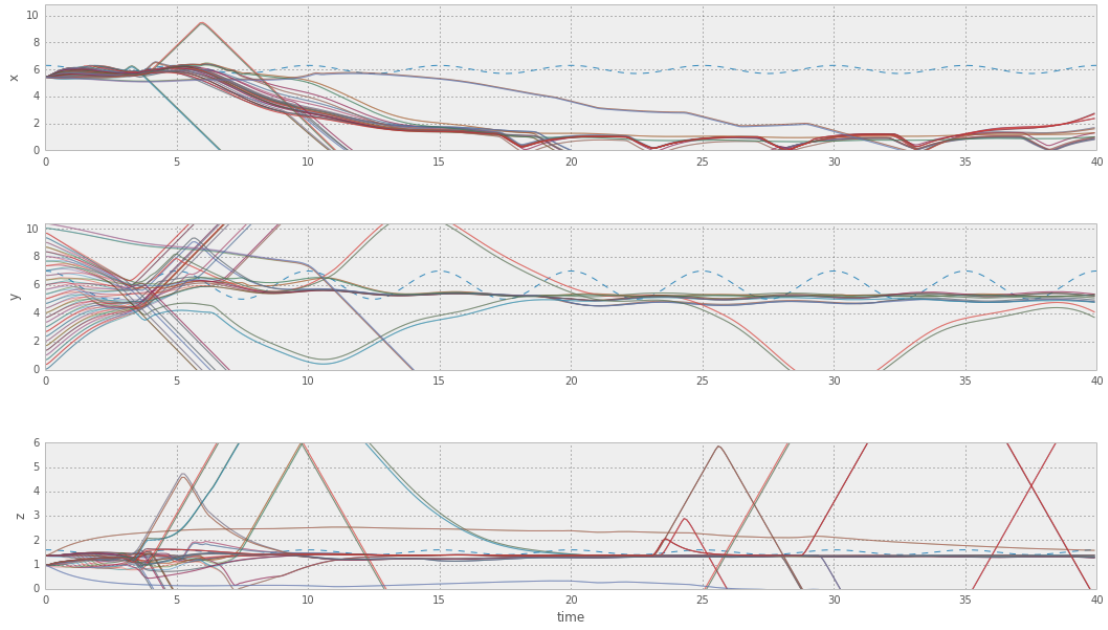


In [6]:
```
p_ = p.copy()
p_['damp'] = .0
print p_['damp']
pos, particles = simul(p_, players)
```

```
0.0
```



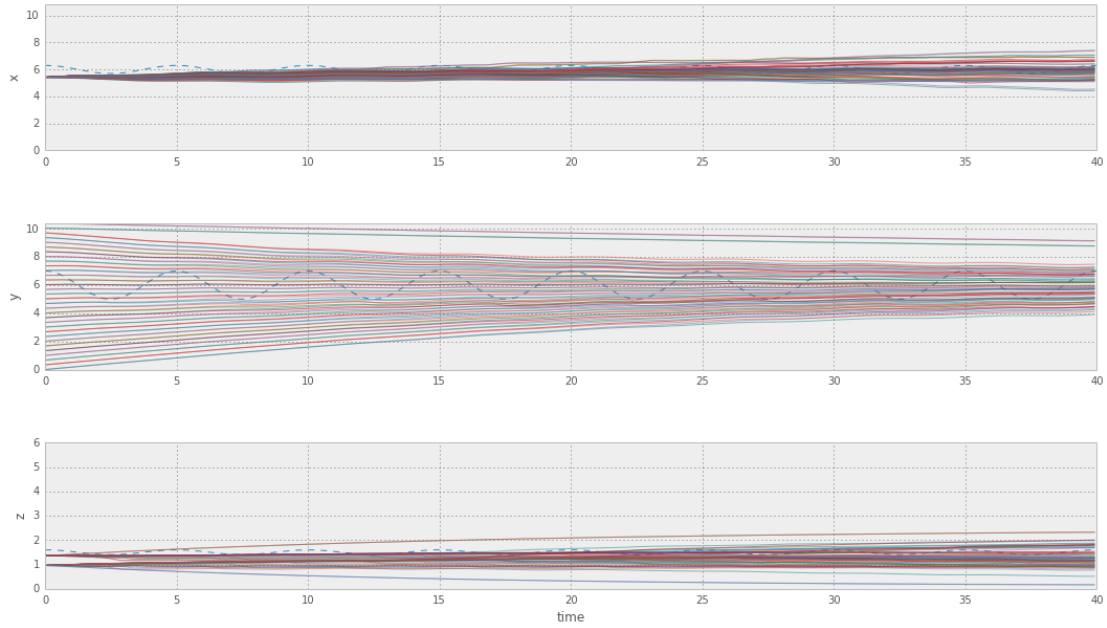
In [7]:
```
p_ = p.copy()
p_['G_repulsion'] = 0.
pos, particles = simul(p_, players)
```



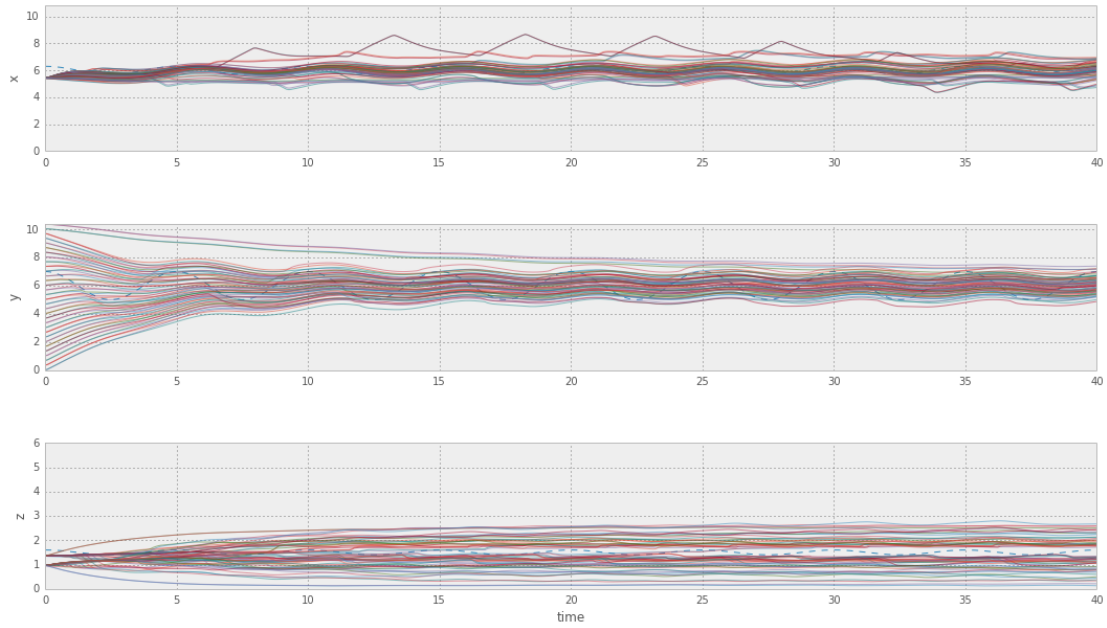
2.1 stabilité avec dt

In [8]:
```
players = [{'center': [6., 6, 1.5], 'amp': [.3,1.,.1] , 'T': 5.}]
# players = [{'center': [VPs[0]['x'] + 1., VPs[0]['y'], VPs[0]['z']], 'amp': [.3, 1.,
for dt in np.logspace(-3., 0., 4, endpoint=False):
    print 'dt = ', dt
    pos, particles = simul(p, players, dt=dt)
    plt.show()
```

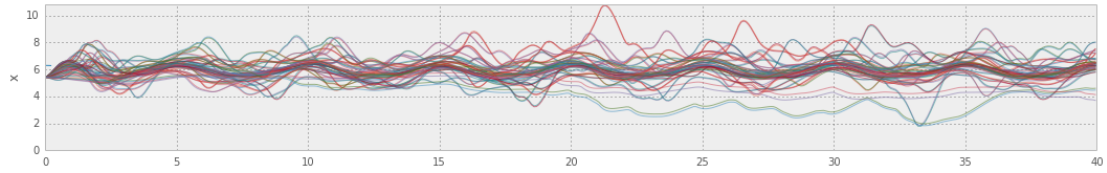
dt = 0.001

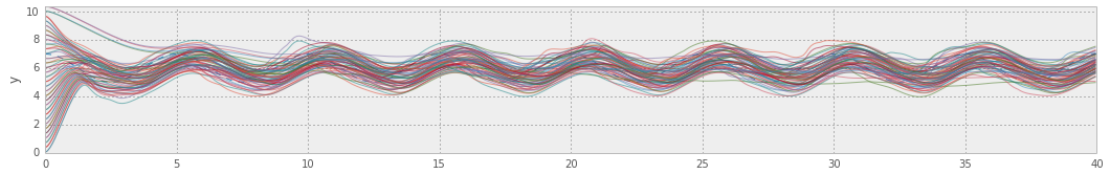


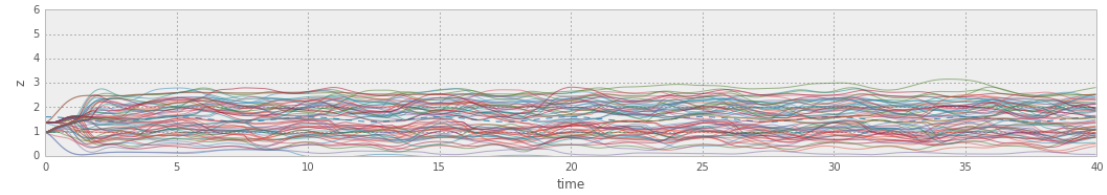
dt = 0.0056234132519



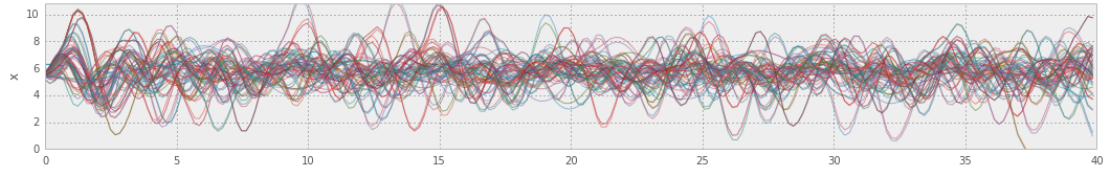
dt = 0.0316227766017

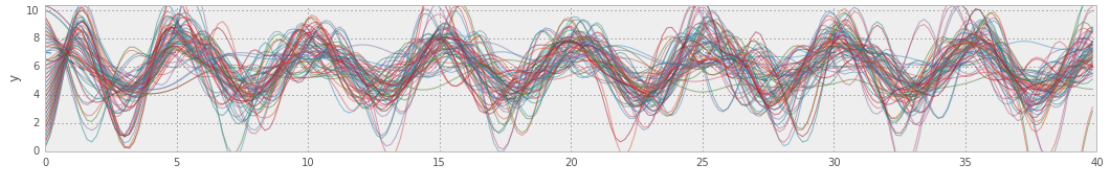


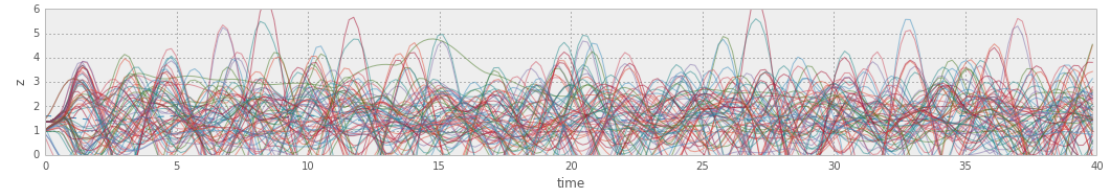





```
dt =  0.177827941004
```







2.2 players instables

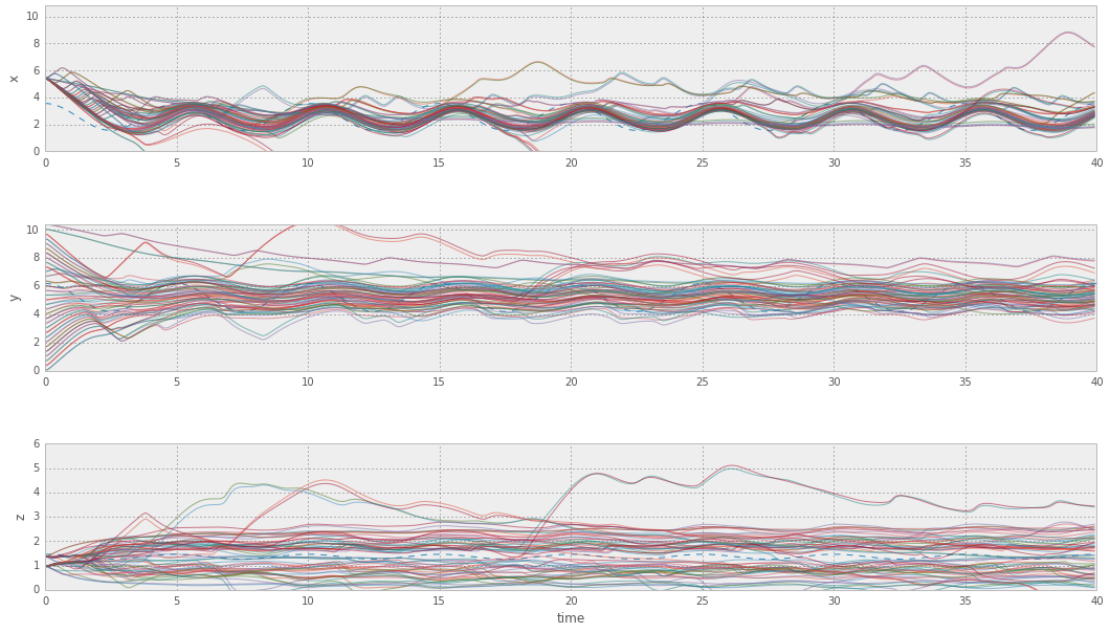
On définit un player seul qui se déplace devant le videoprojecteur, à une distance

In [9]:
```
print dt
i_vp = 1
print VPs[i_vp]
```

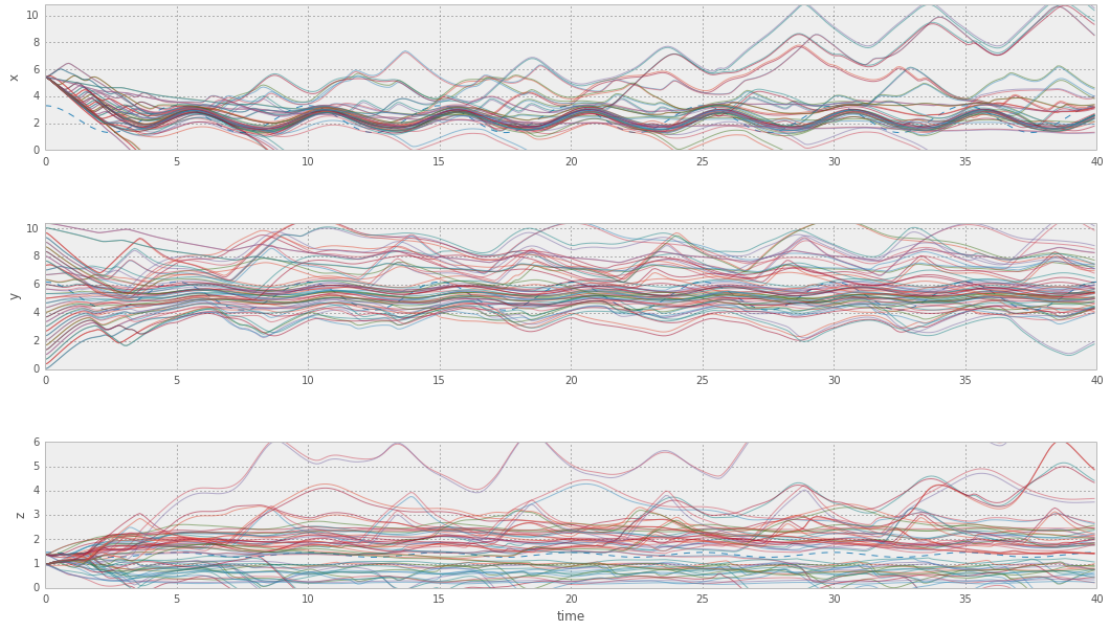
```
0.177827941004
{'cz': 1.36, 'cy': 5.19, 'cx': 10.85, 'pc_min': 0.001, 'address':
'10.42.0.56', 'y': 5.19, 'x': 0.55, 'pc_max': 1000000.0, 'z': 1.36,
'foc': 21.802535306060136}
```

In [10]:
```
for distance in np.linspace(2., 0., 8, endpoint=False):
    print 'Distance du player au VP = ', distance
    players = [{'center': [VPs[i_vp]['x'] + distance, VPs[i_vp]['y'], VPs[i_vp]['z']],
                'amp': [1., 1., .1] , 'T': 5.}]
    pos, particles = simul(p, players)
    plt.show()
```

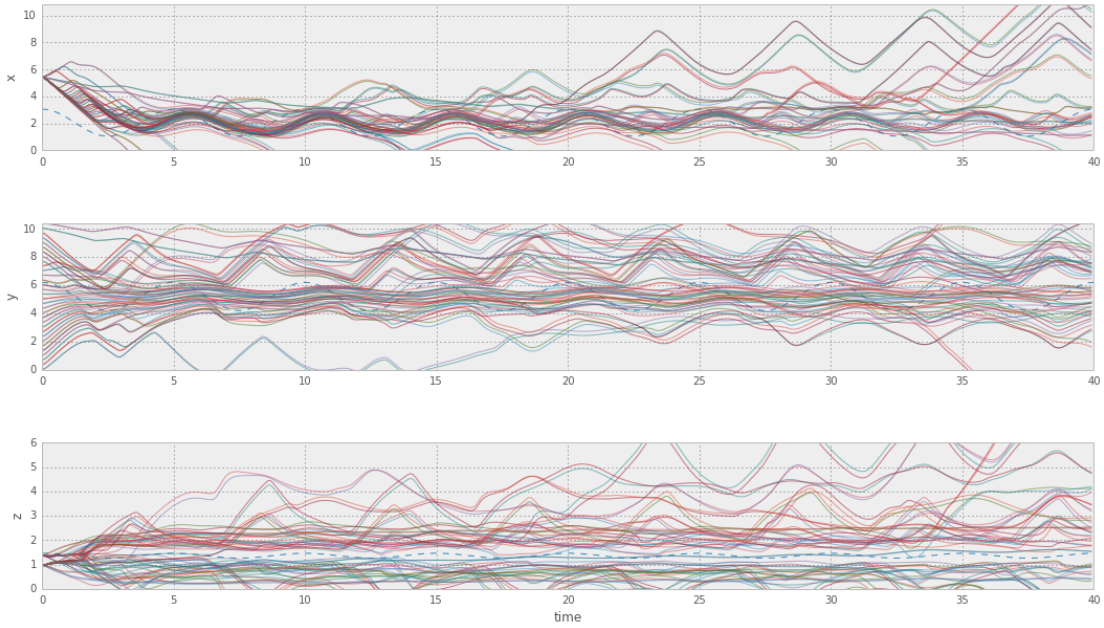
```
Distance du player au VP =  2.0
```



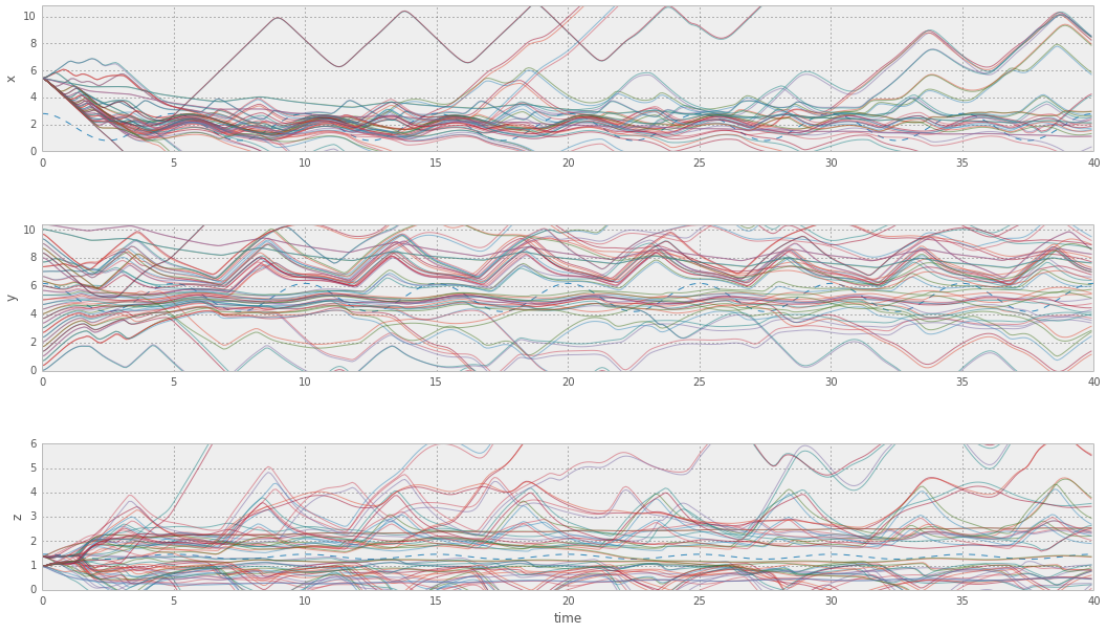

```
Distance du player au VP =  1.75
```



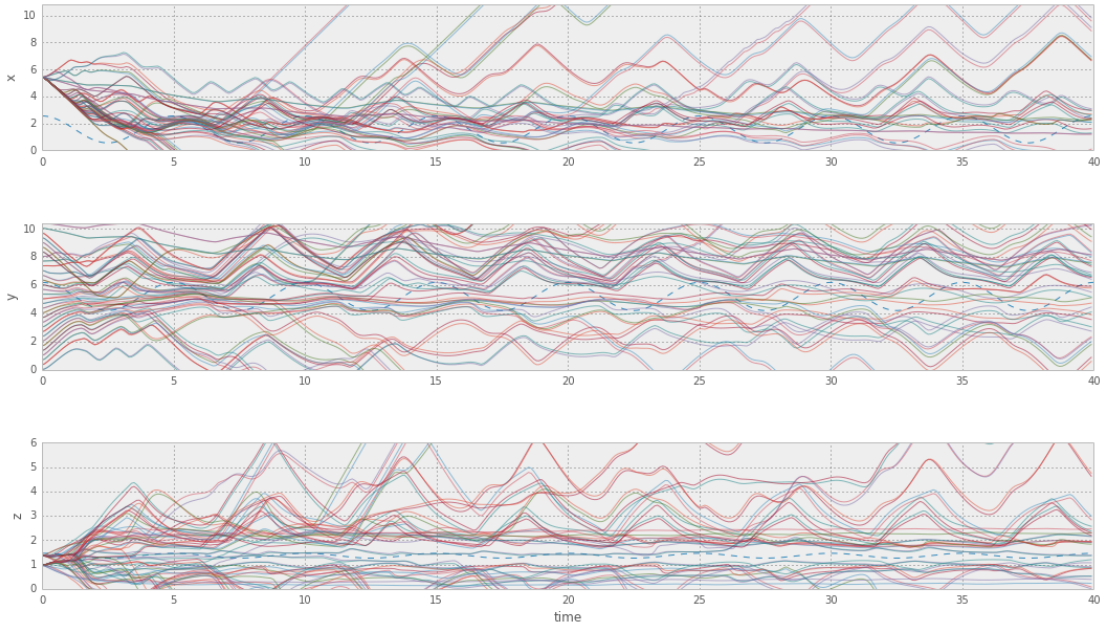

```
Distance du player au VP =  1.5
```



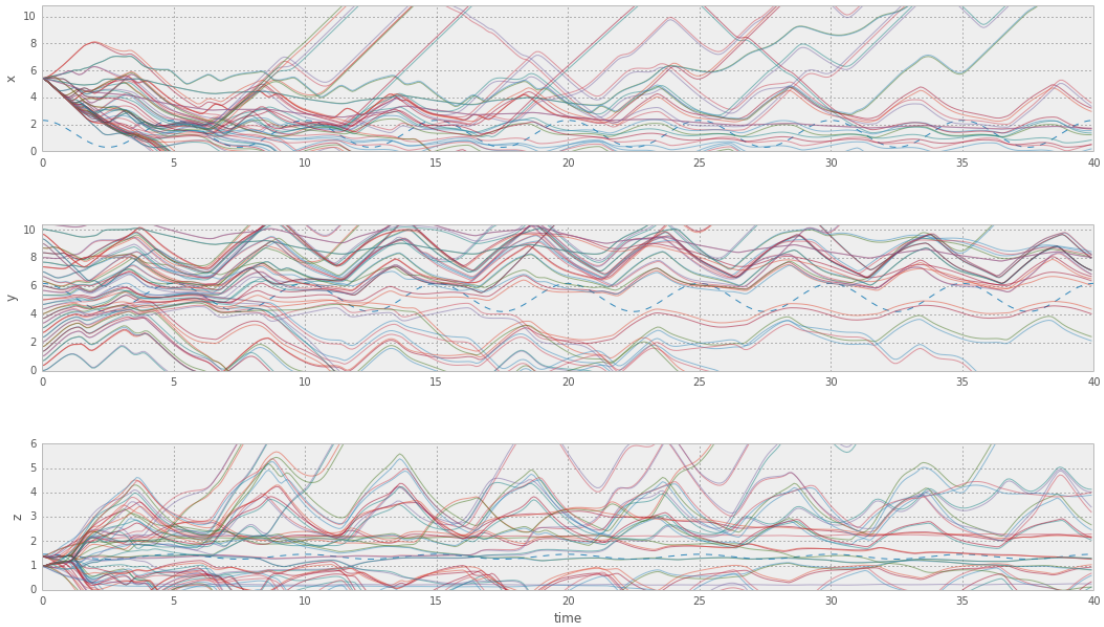
Distance du player au VP = 1.25



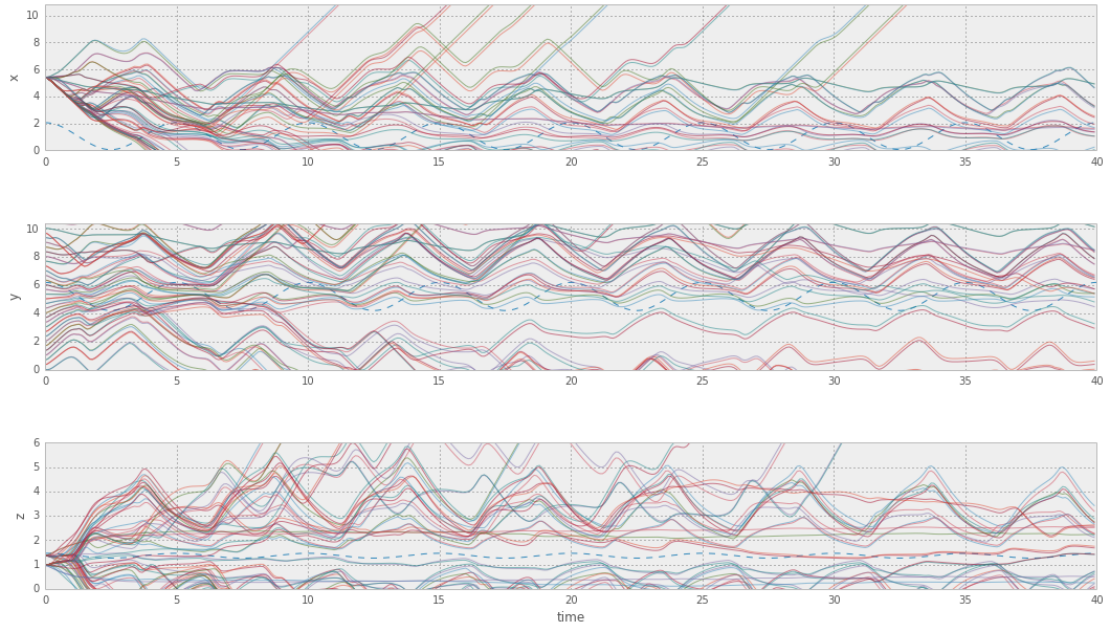
Distance du player au VP = 1.0



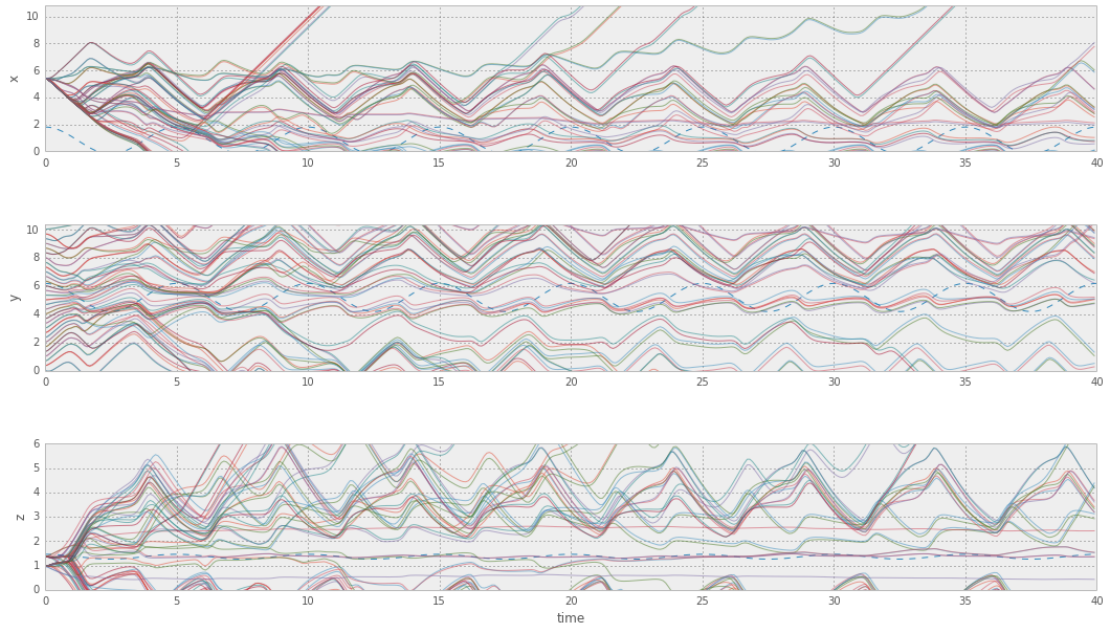
Distance du player au VP = 0.75



Distance du player au VP = 0.5



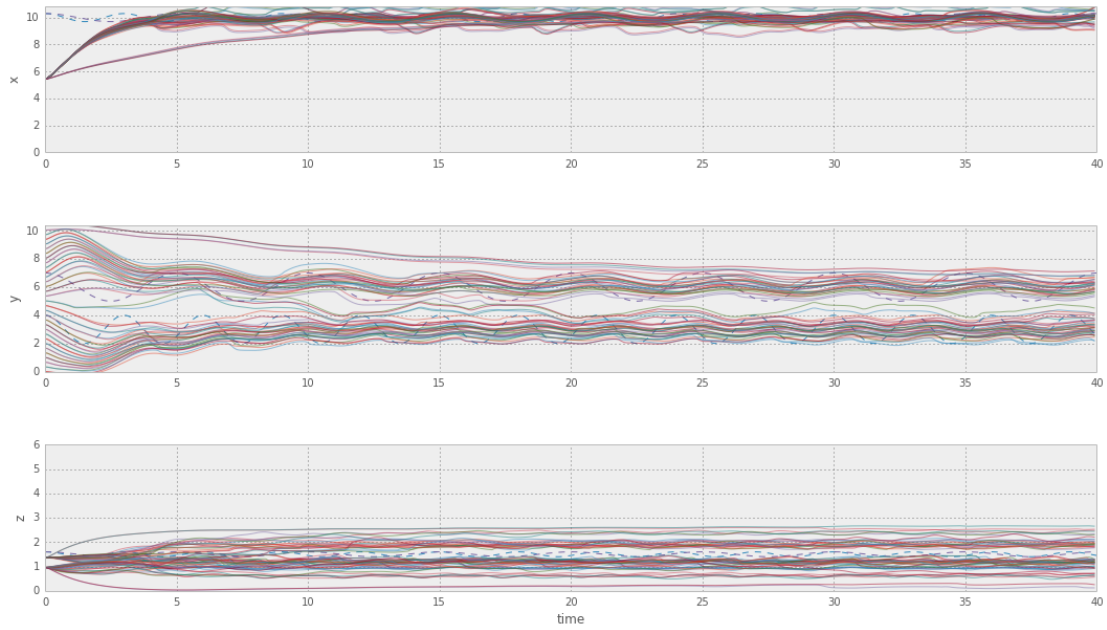

```
Distance du player au VP =  0.25
```



(note: il faut bien regarder l'amplitude des variations sur les axes)

2.3 multi players

In [11]:
```
players = [{'center': [10., 3, 1.5], 'amp': [.3,1.,.1] , 'T': 3.},
           {'center': [10., 6, 1.5], 'amp': [.3,1.,.1] , 'T': 5.}]
pos, particles = simul(p, players)
```

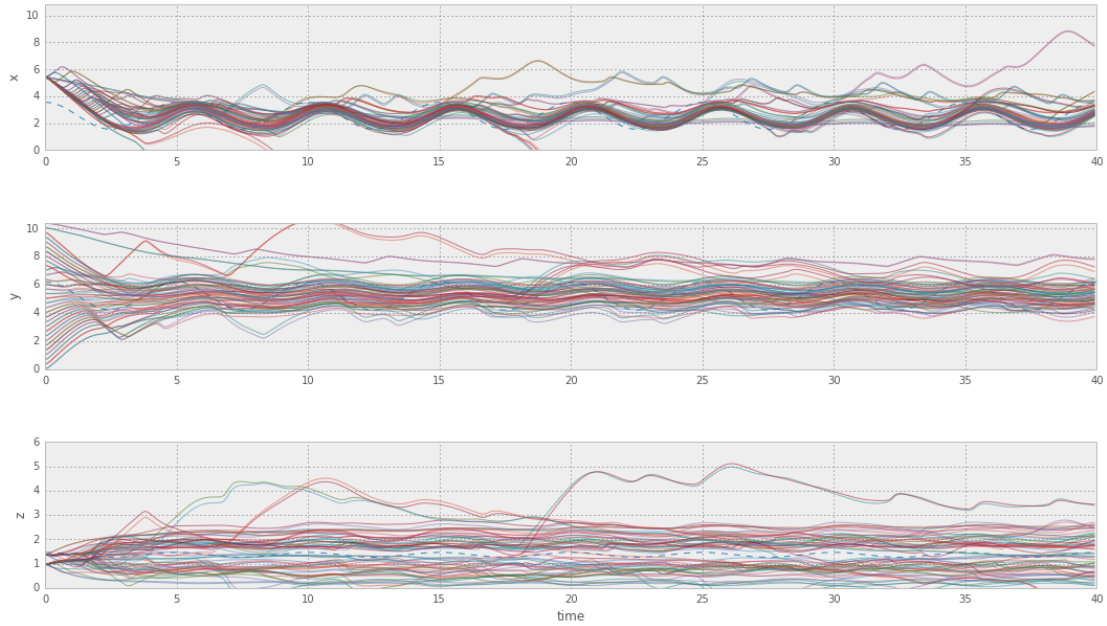


2.4 étude de la stabilité avec une autre personne

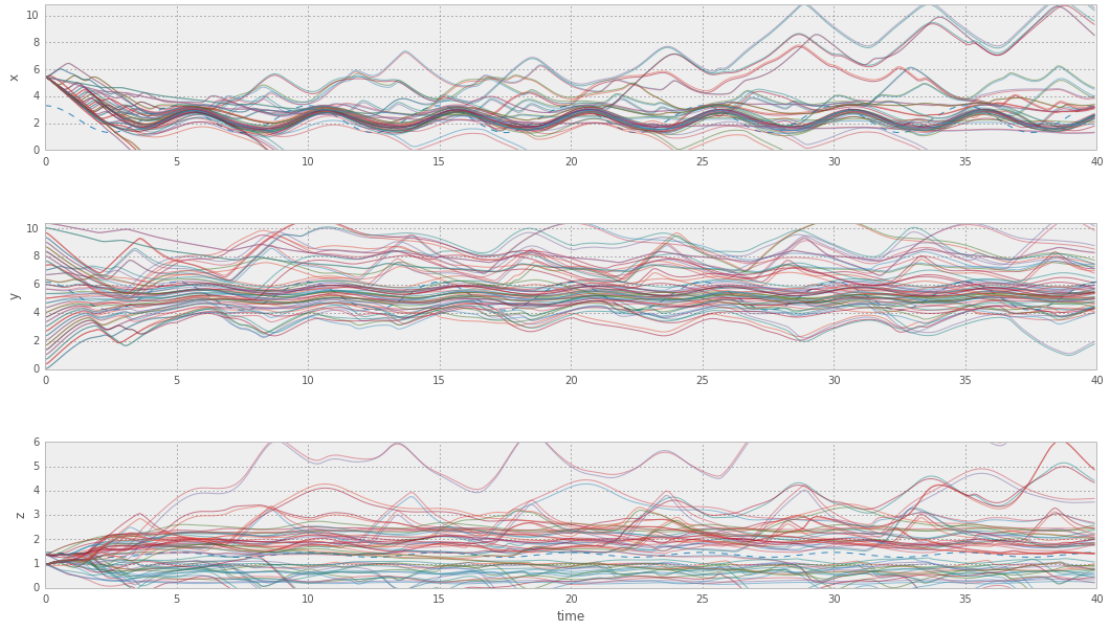
TODO: voir si on peut éviter de masquer des personnes dans le meme axe en annihilant cette force et en donnant ainsi plus de forces aux interactions venant des autres VPs / dynamique

In [12]:
```
for distance in np.linspace(2., 0., 8, endpoint=False):
    players = [{'center': [10., 6, 1.5], 'amp': [.3,1.,.1] , 'T': 15.}]
    print 'Distance du player au VP = ', distance
    players = [{'center': [VPs[i_vp]['x'] + distance, VPs[i_vp]['y'], VPs[i_vp]['z']],
                'amp': [1., 1., .1] , 'T': 5.}]
    pos, particles = simul(p, players)
    plt.show()
```

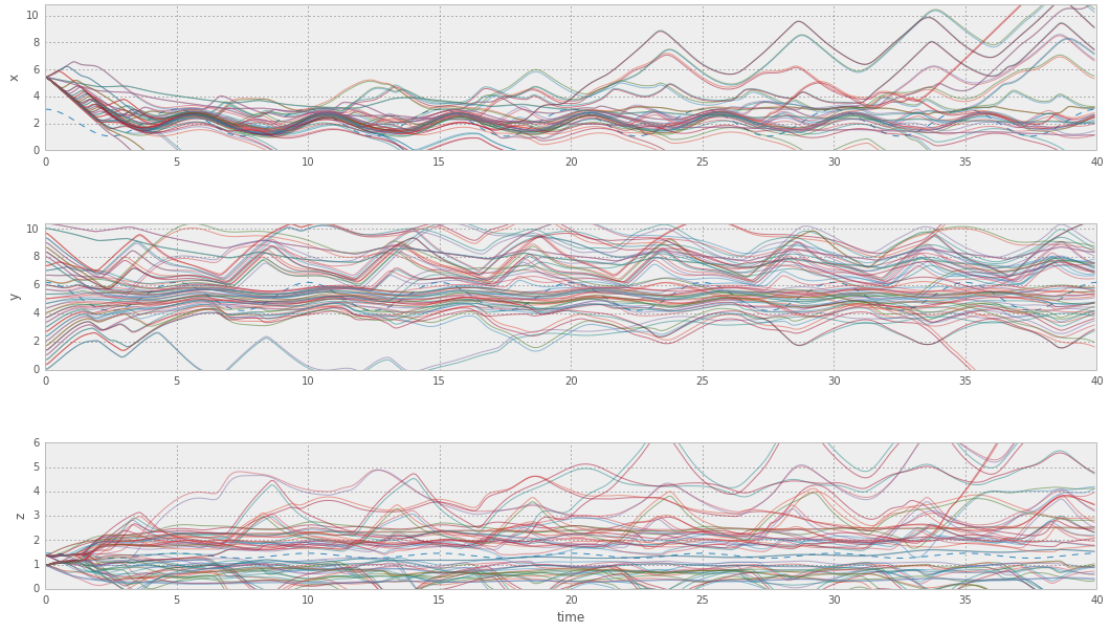
```
Distance du player au VP =  2.0
```



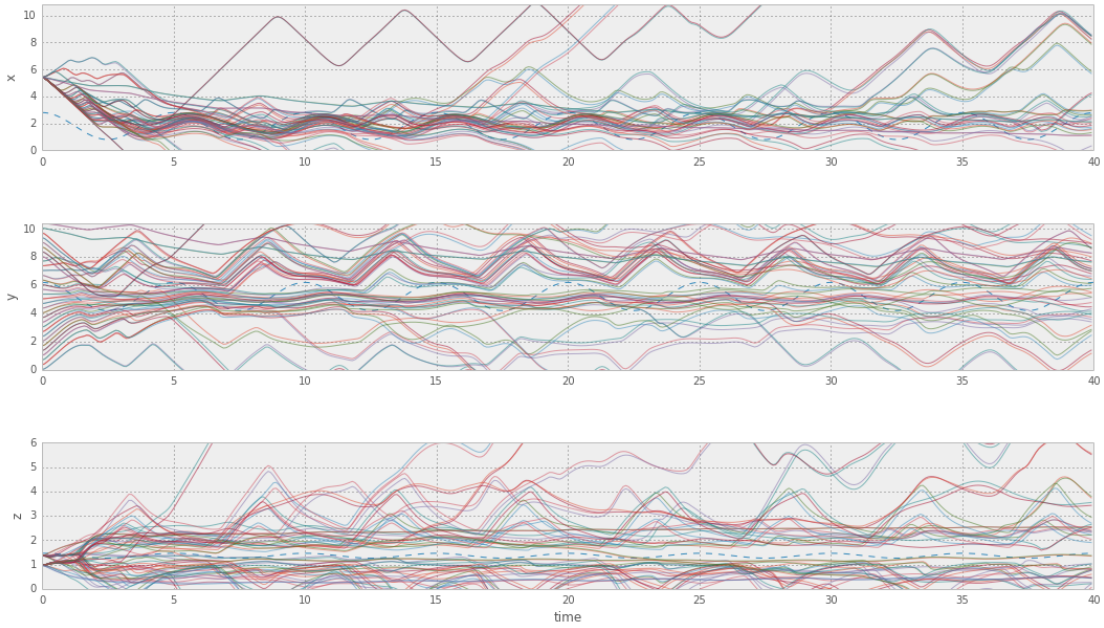
Distance du player au VP = 1.75



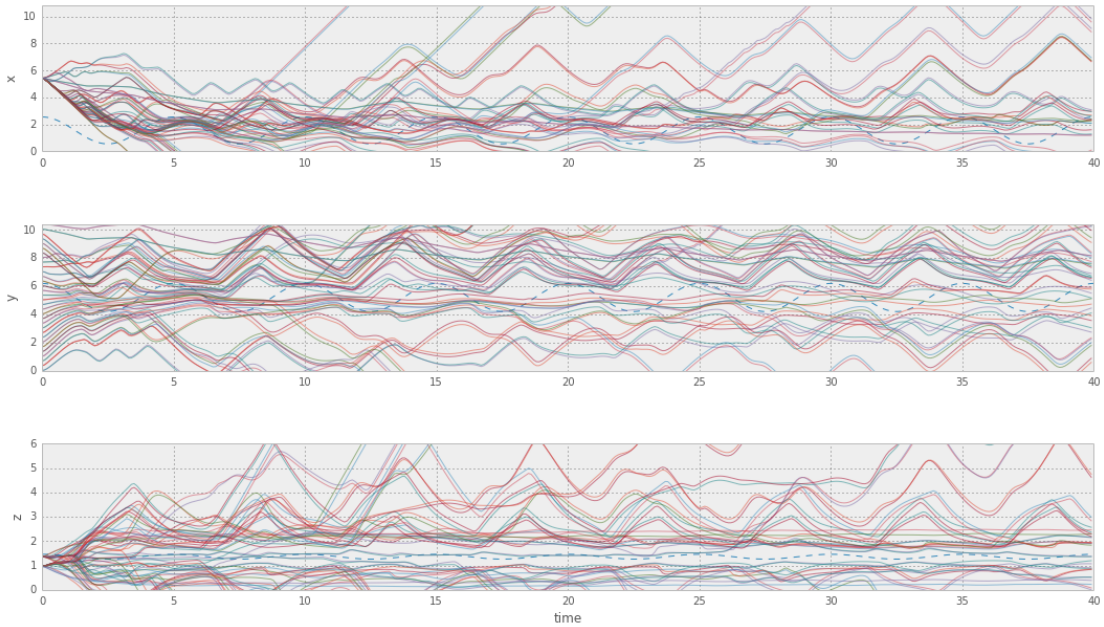
Distance du player au VP = 1.5



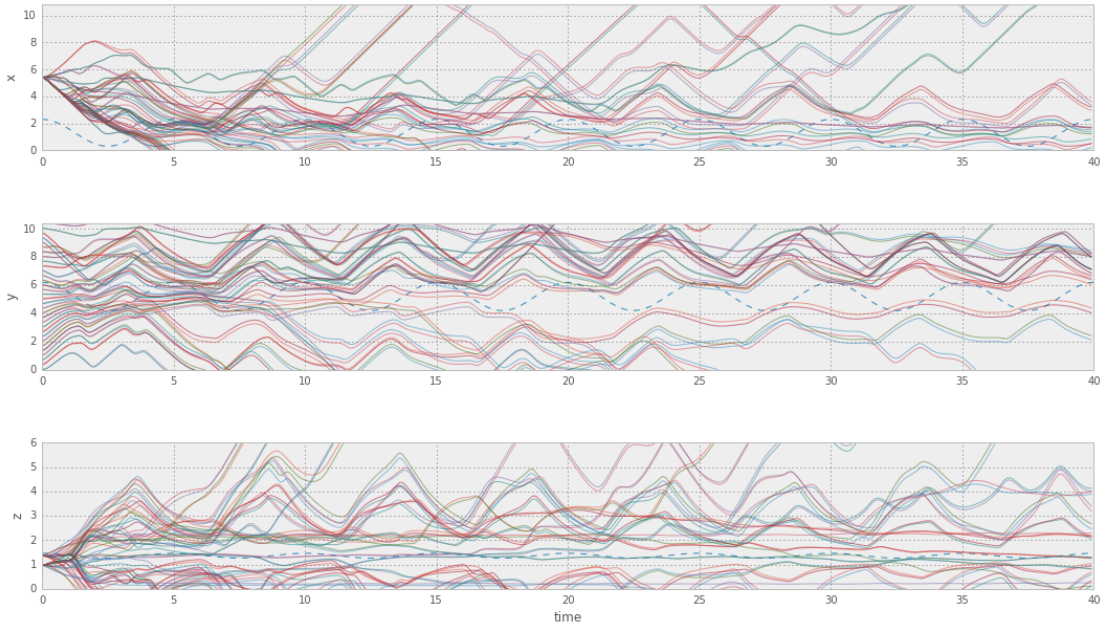
Distance du player au VP = 1.25



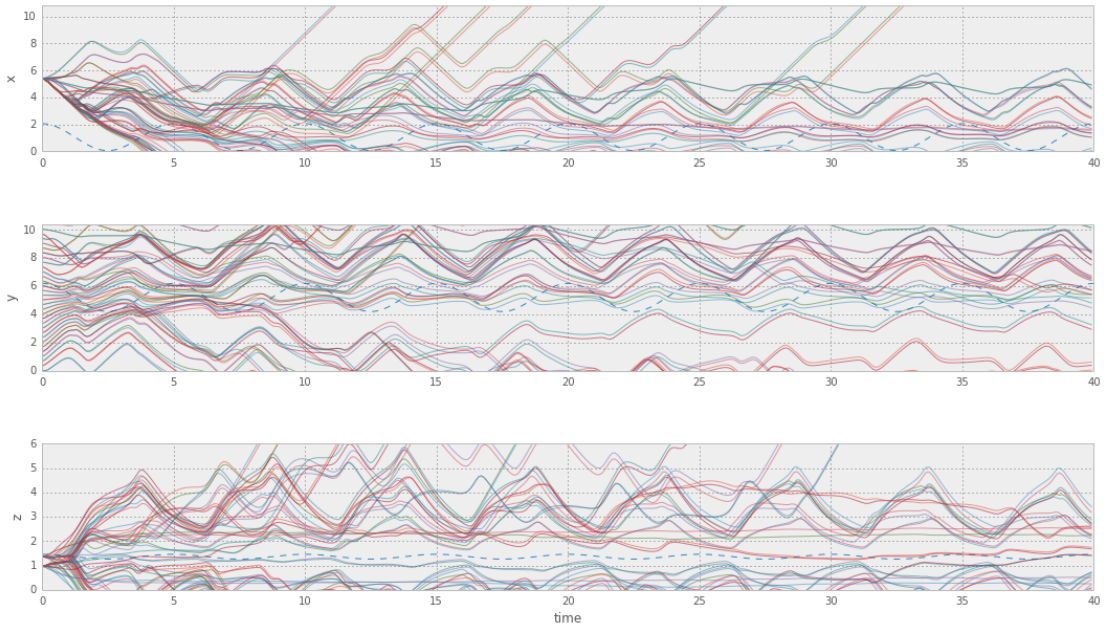
Distance du player au VP = 1.0



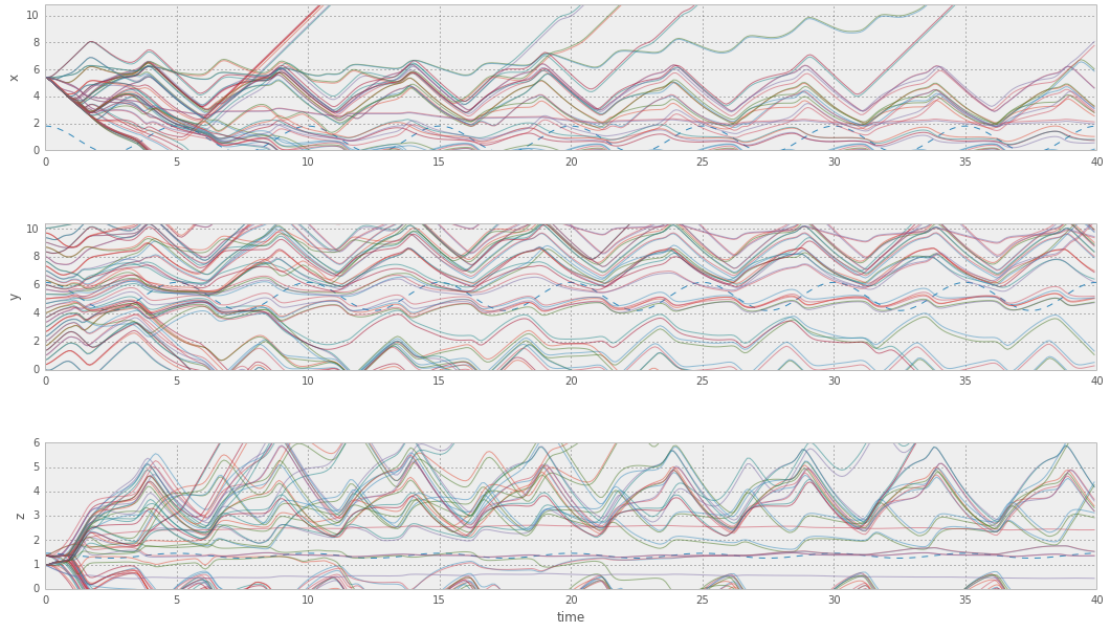
Distance du player au VP = 0.75



Distance du player au VP = 0.5



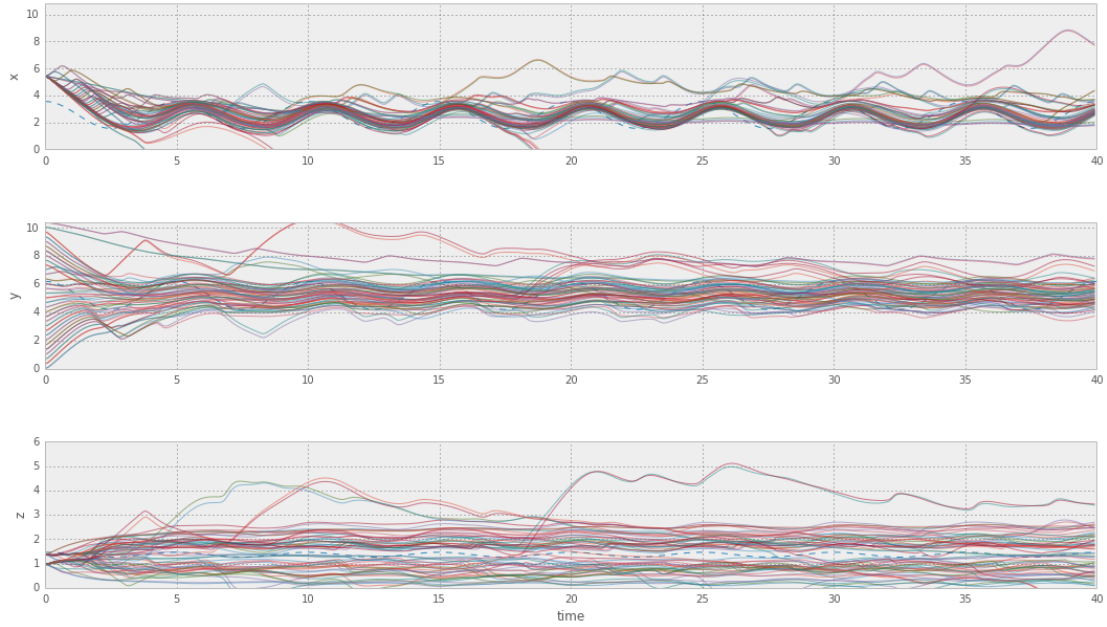
Distance du player au VP = 0.25



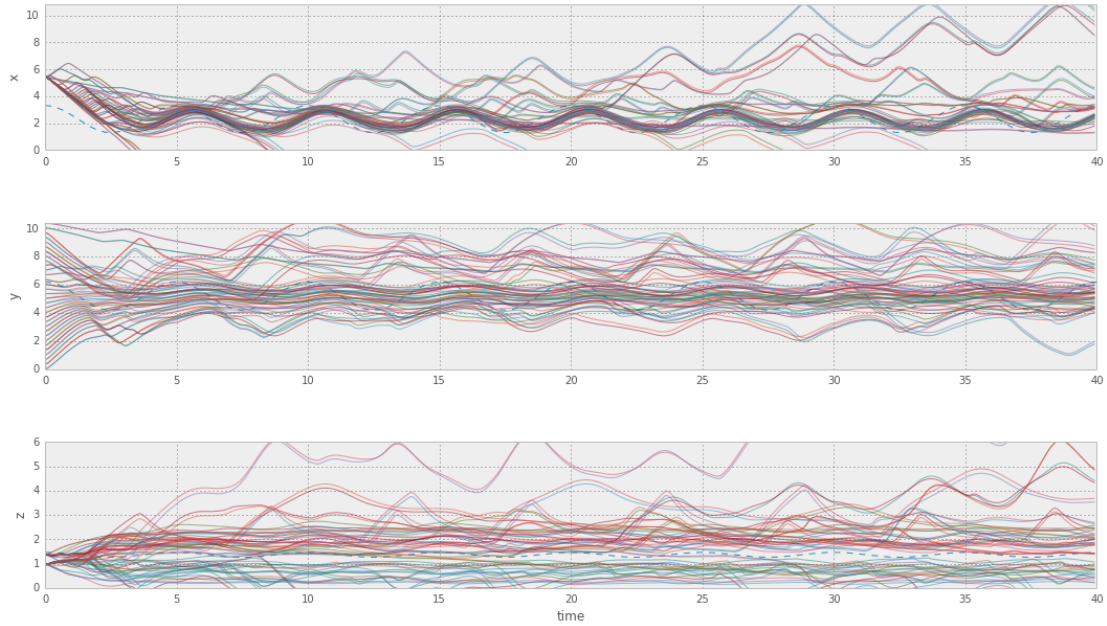
2.5 étude de la stabilité avec quatre autres personnes

In [13]:
```
for distance in np.linspace(2., 0., 8, endpoint=False):
    players = [{'center': [5., 6, 1.5], 'amp': [1.3,1.,.1] , 'T': 15.},
               {'center': [6., 4, 1.5], 'amp': [2.3,1.,.1] , 'T': 3.},
               {'center': [5., 3, 1.9], 'amp': [4.3,1.,.1] , 'T': 15.},
               {'center': [8., 4, 1.], 'amp': [5.3,1.,.1] , 'T': 3.}]
    print 'Distance du player au VP = ', distance
    players = [{'center': [VPs[i_vp]['x'] + distance, VPs[i_vp]['y'], VPs[i_vp]['z']],
                'amp': [1., 1., .1] , 'T': 5.}]
    pos, particles = simul(p, players)
    plt.show()
```

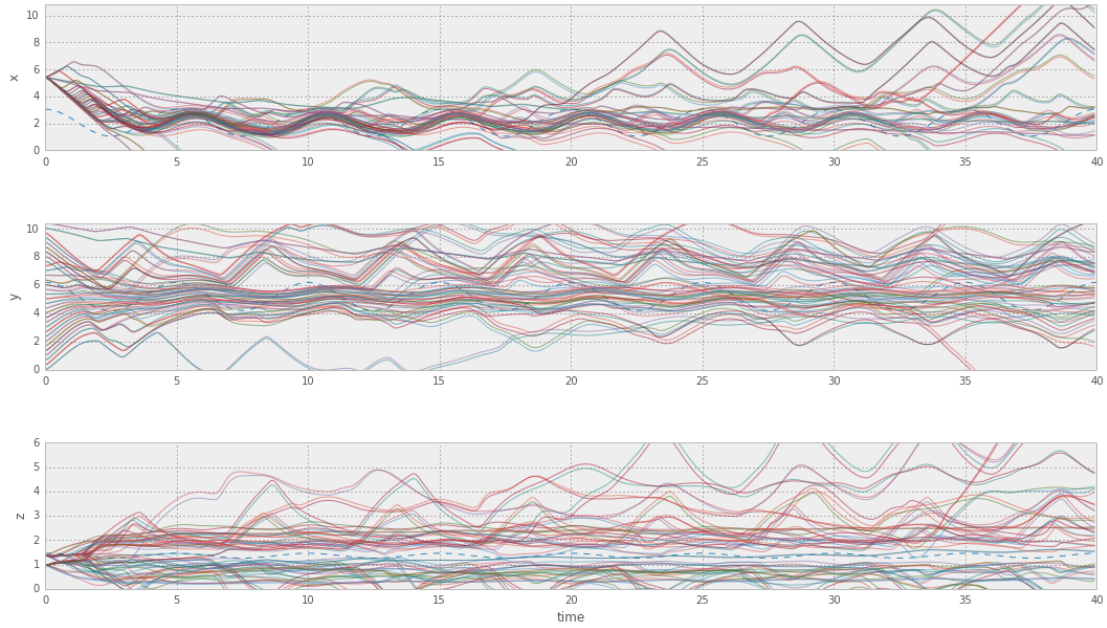
```
Distance du player au VP =  2.0
```



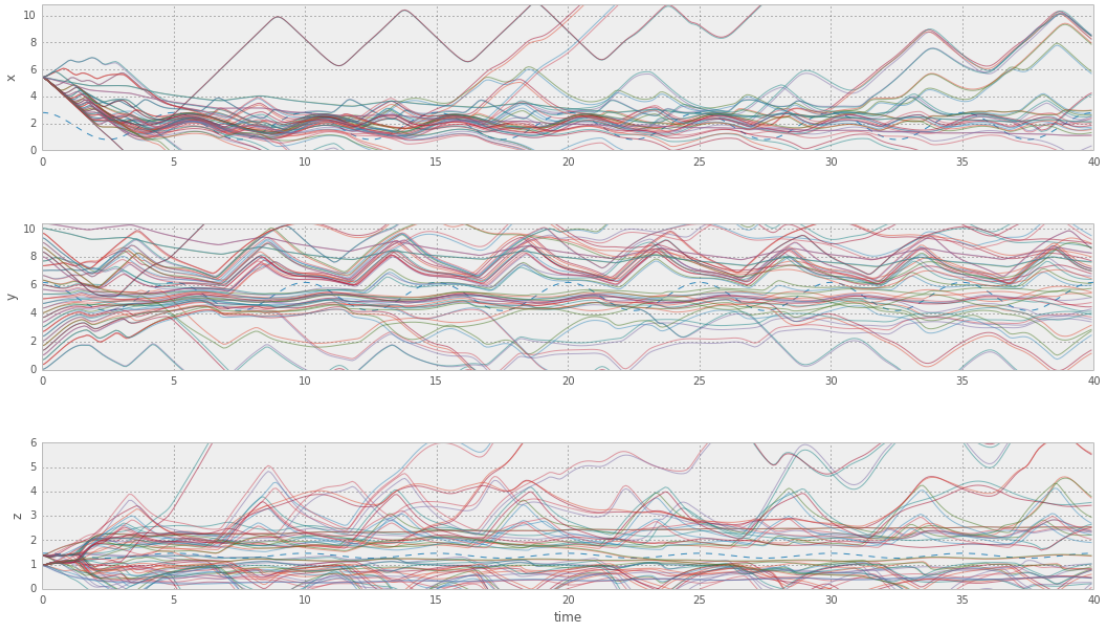
Distance du player au VP = 1.75



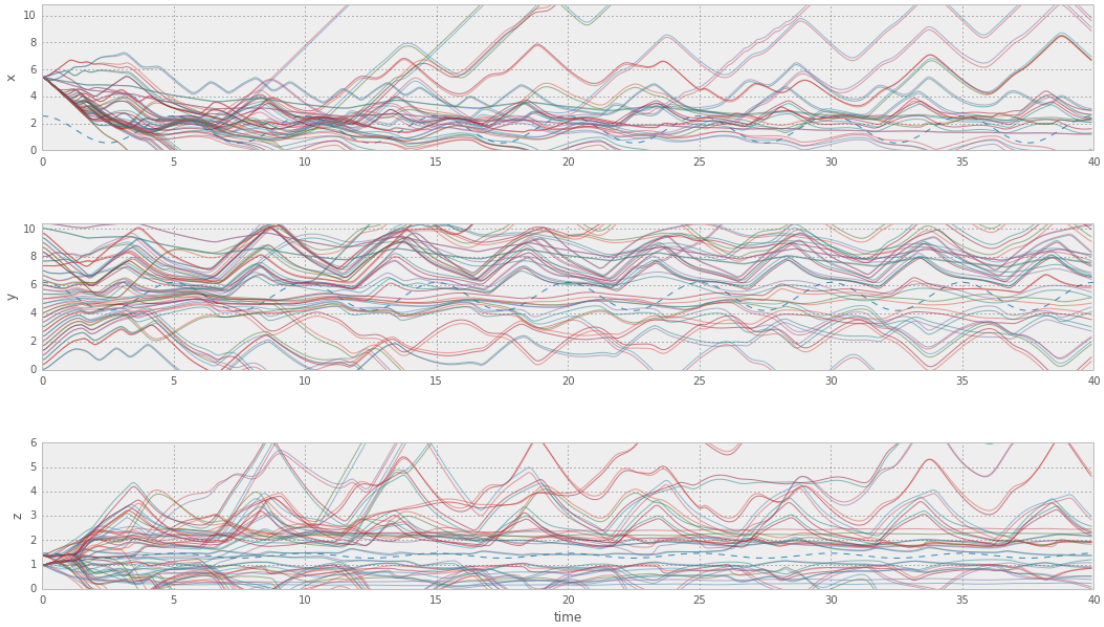
Distance du player au VP = 1.5



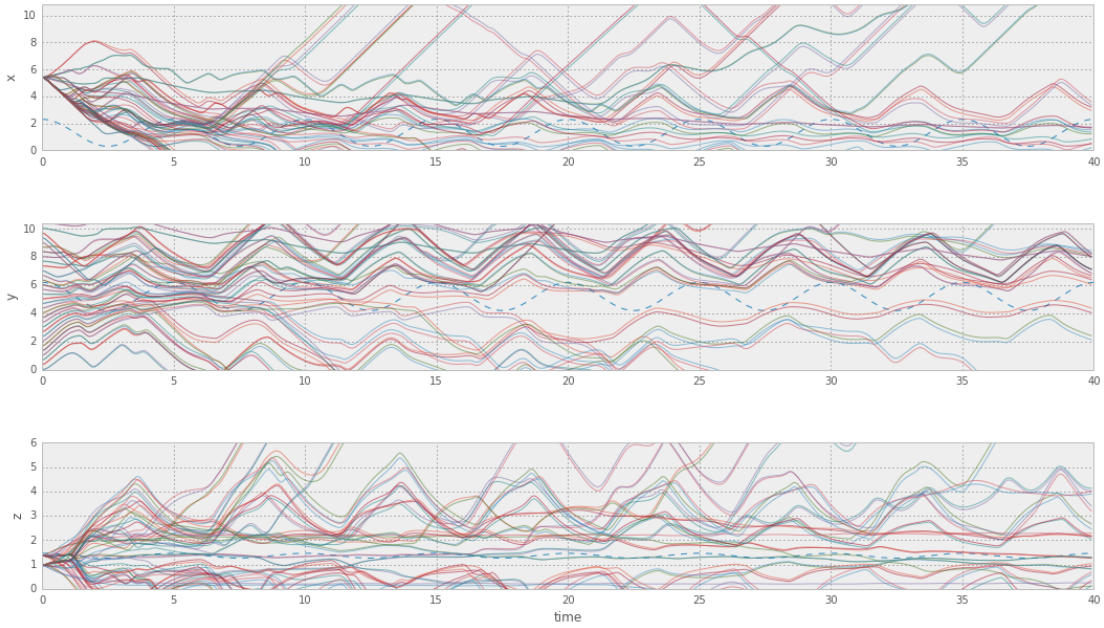
Distance du player au VP = 1.25



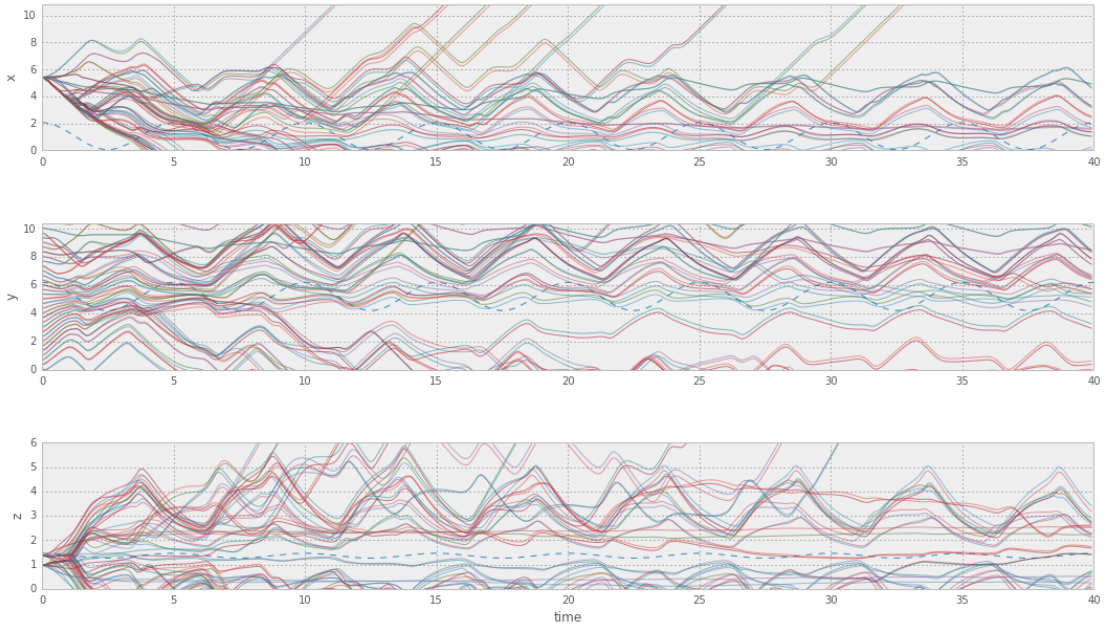
Distance du player au VP = 1.0



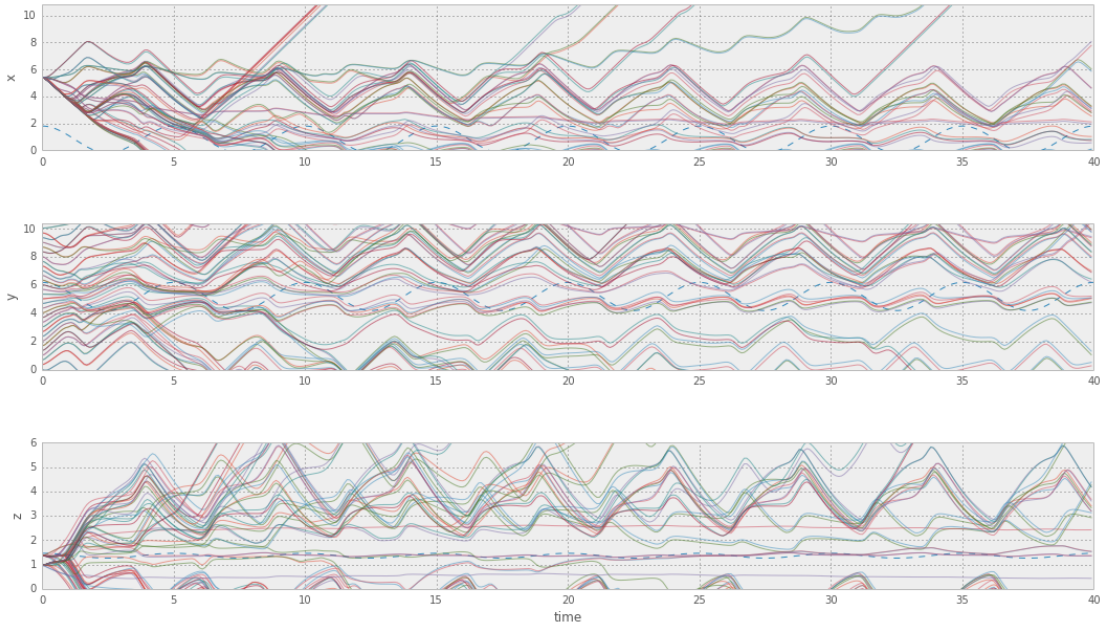
Distance du player au VP = 0.75



Distance du player au VP = 0.5



Distance du player au VP = 0.25



3 étude quantitative et paramétrique de la stabilité

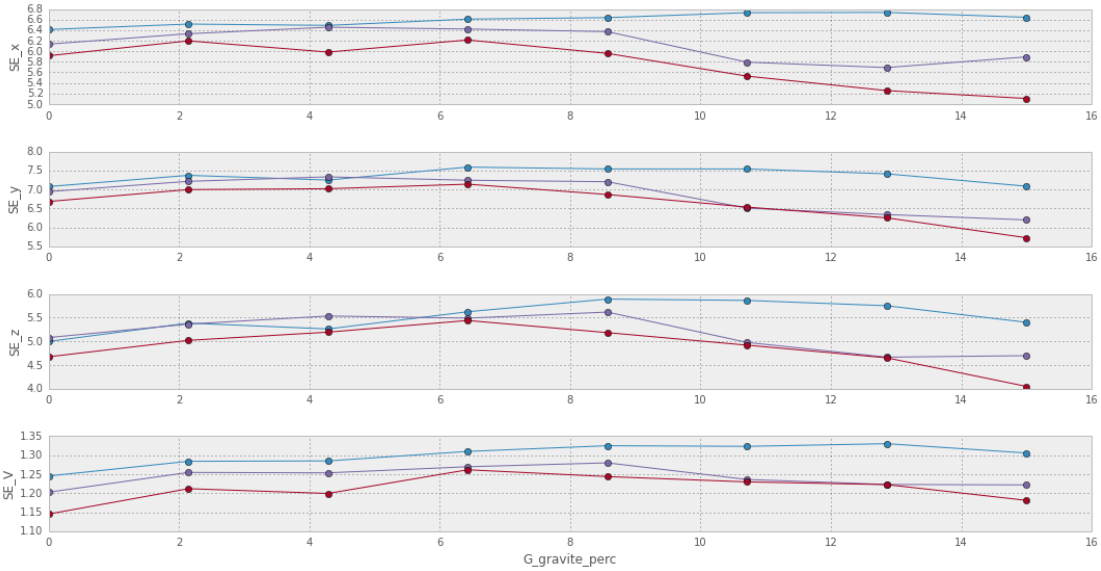
In [14]:

```
def simul_param(p, distance=0.25, N_distance=3, N_start=2., t_stop=10., i_vp=1, displa

    print "Studying stability by changing model along variable(s) :", params

    first_key = params.keys()[0]
    N_params = np.size(params[first_key])
    SE = np.zeros((4, N_params, N_distance))

    for i_distance in np.arange(N_distance):
        players = [{'center': [5., 6, 1.5], 'amp': [1.3,1.,.1] , 'T': 15.},
                   {'center': [6., 4, 1.5], 'amp': [2.3,1.,.1] , 'T': 3.},
                   {'center': [VPs[i_vp]['x'] + (i_distance+1)*distance, VPs[i_vp]['y'
                    'amp': [1., 1.,.1] , 'T': 5.}]
        for i_param, param in enumerate(params[first_key]):
            new_params = p.copy()
            for key in params.keys():
                new_params[key] = params[key][i_param]

            #v.execute('positions, particles = simul(players=players, display=False, p

            positions, particles = simul(players=players, display=False, p=new_params,

            error = (positions[:, -1, :][:, np.newaxis, :] - particles[:3, :, :])**2
            error += (positions[:, -1, :][:, np.newaxis, :] - particles[3:6, :, :])**2
            error_V = particles[6:, :, :]**2
            SE[:3, i_param, i_distance] = np.sqrt(error[:, :, int(N_start/dt):].mean(a
            SE[-1, i_param, i_distance] = np.sqrt(error_V[:, :, int(N_start/dt):].mean

    if display:
        fig = plt.figure(figsize=(18,9))
        for i_ax, axe in zip(range(4), ['x', 'y', 'z', 'V']):
            ax = fig.add_subplot(4, 1, 1+ i_ax)
            ax.plot(params[first_key], SE[i_ax, :, :], 'o-')
            ax.set_ylabel(r'SE_' + axe)
        ax.set_xlabel(first_key)
```

3.1 parametres dynamiques majeurs

In [15]:
```
params = {'G_gravite_perc': np.linspace(.0, 15., 8, endpoint=True)}
simul_param(p, **params)
```

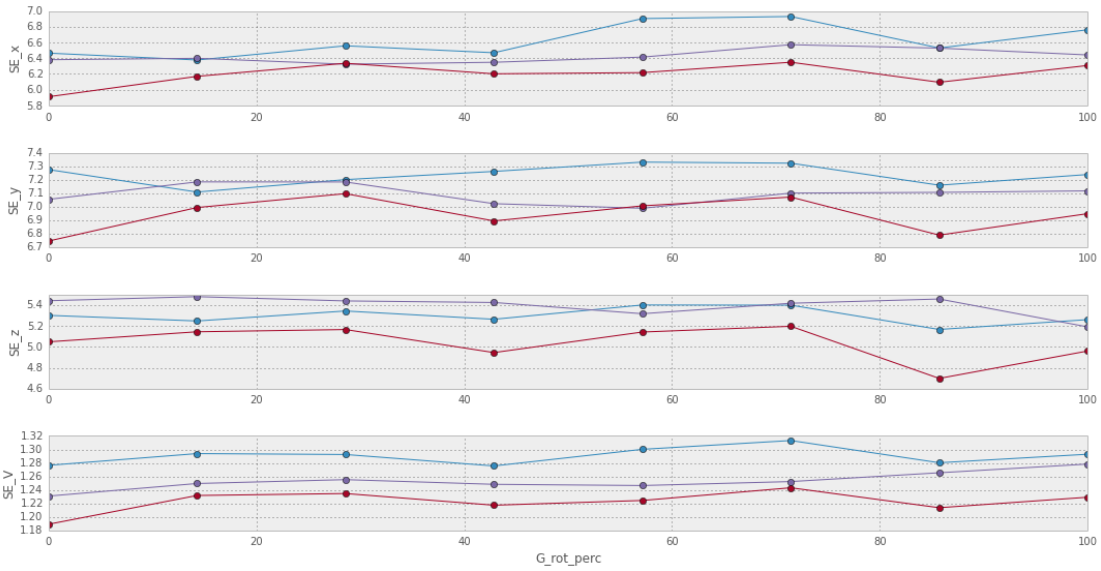
```
Studying stability by changing model along variable(s) :
{'G_gravite_perc': array([  0.        ,   2.14285714,   4.28571429,
6.42857143,
         8.57142857,  10.71428571,  12.85714286,  15.        ])}
```



In [16]:
```
#params = {'kurt_gravitation': np.linspace(-2, 5., 6, endpoint=True)}
#simul_param(p, **params)
```

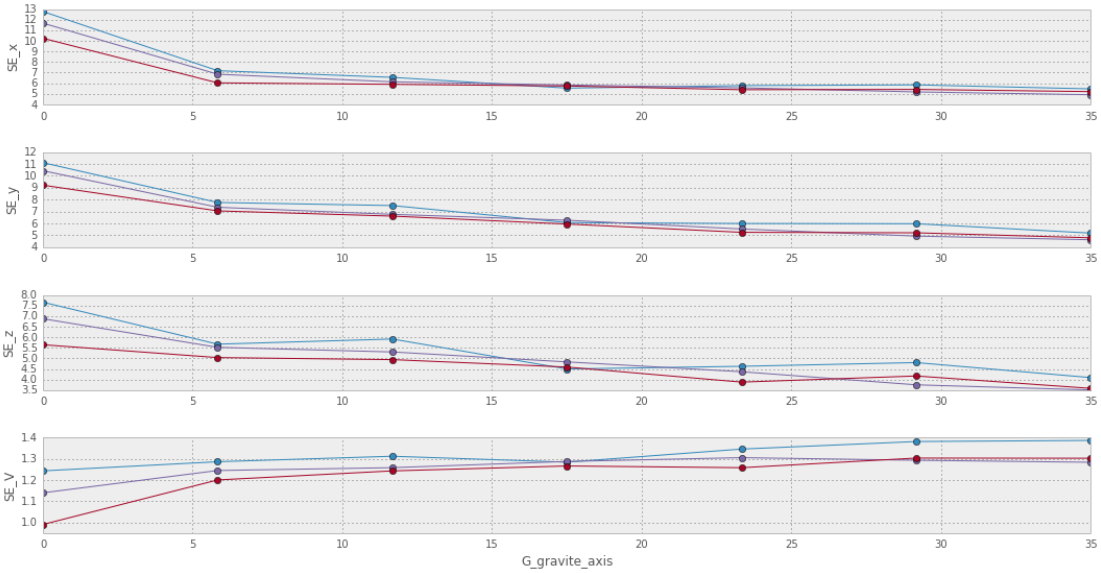
In [17]:
```
params = {'G_rot_perc': np.linspace(.0, 100., 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) :
{'G_rot_perc': array([   0.        ,   14.28571429,   28.57142857,
42.85714286,
         57.14285714,   71.42857143,   85.71428571,  100.        ])}
```



In [18]:
```
params = {'G_gravite_axis': np.linspace(.0, 35., 7, endpoint=True)}
simul_param(p, **params)
```

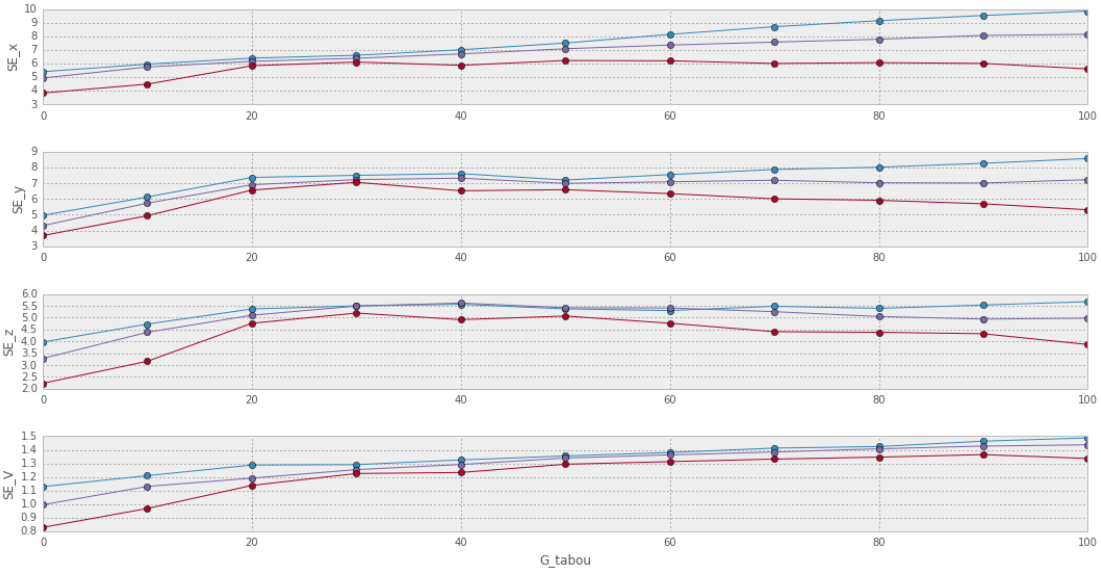
```
Studying stability by changing model along variable(s) :
{'G_gravite_axis': array([  0.        ,   5.83333333,  11.66666667,
17.5       ,
        23.33333333,  29.16666667,  35.        ])}
```



3.2 parametres dynamiques secondaires (textures)

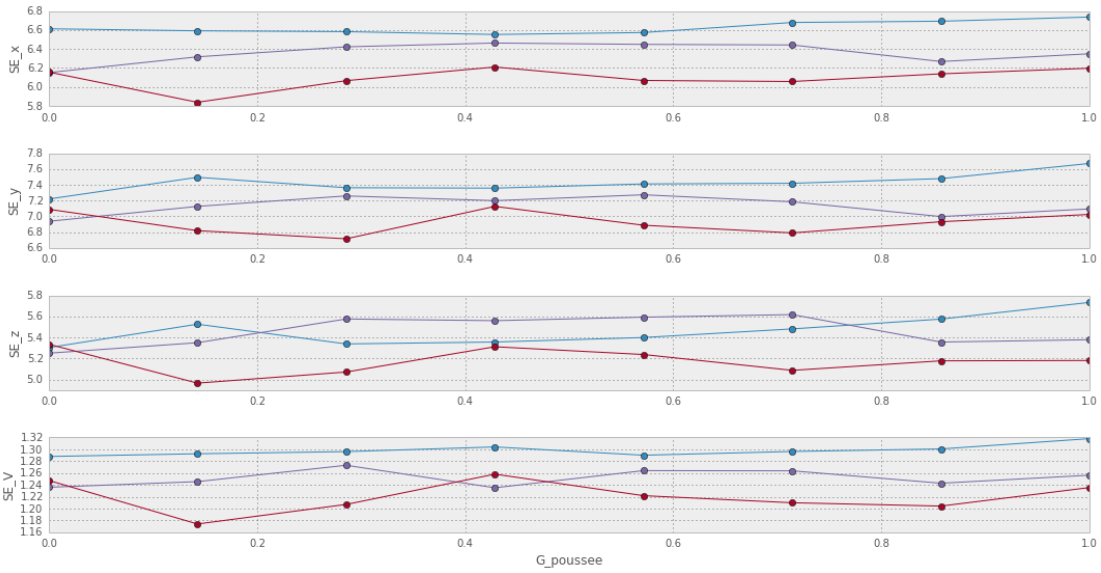
In [19]:
```
params = {'G_tabou': np.linspace(.0, 100., 11, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'G_tabou':
array([   0.,   10.,   20.,   30.,   40.,   50.,   60.,   70.,   80.,
         90.,  100.])}
```



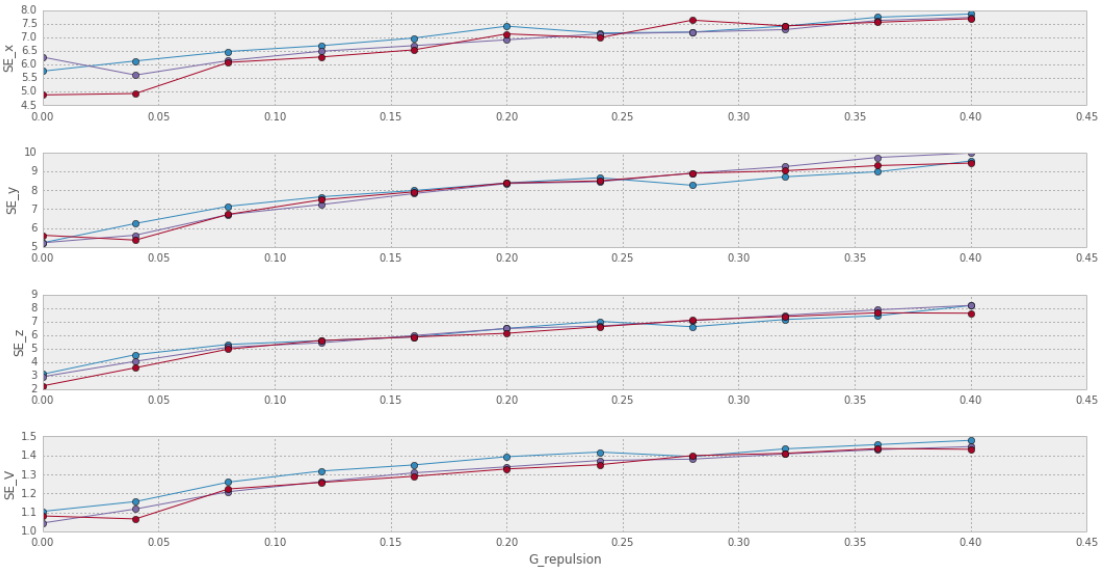
In [20]:
```
params = {'G_poussee': np.linspace(.0, 1., 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'G_poussee':
array([ 0.        ,  0.14285714,  0.28571429,  0.42857143,
0.57142857,
        0.71428571,  0.85714286,  1.        ])}
```



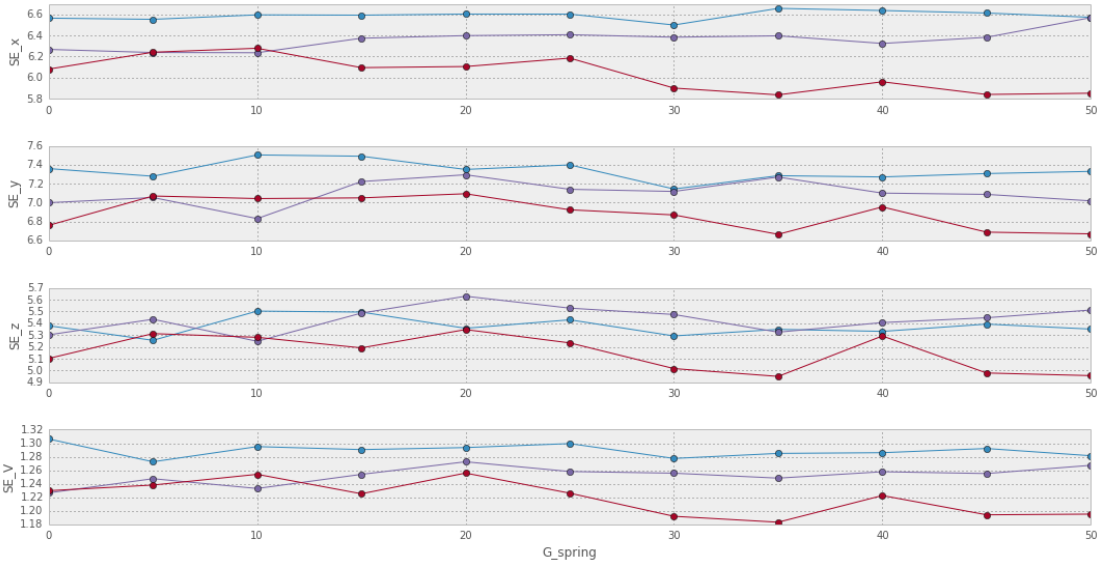
In [21]:
```
params = {'G_repulsion': np.linspace(.0, .4, 11, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) :
{'G_repulsion': array([ 0.  ,  0.04,  0.08,  0.12,  0.16,  0.2 ,
0.24,  0.28,  0.32,
        0.36,  0.4 ])}
```



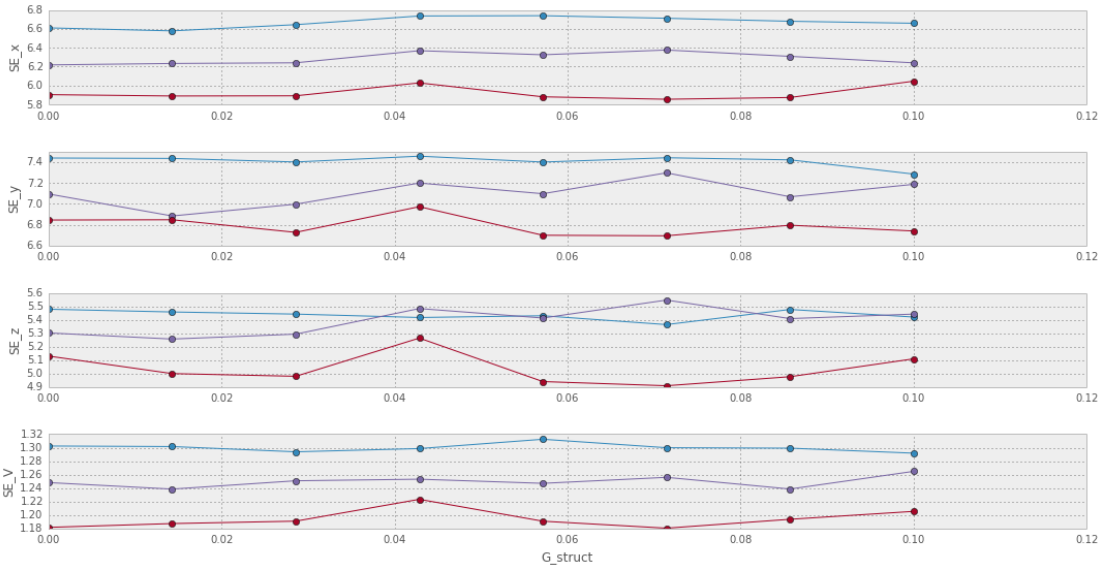
In [22]:
```
params = {'G_spring': np.linspace(.0, 50., 11, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'G_spring':
array([  0.,   5.,  10.,  15.,  20.,  25.,  30.,  35.,  40.,  45.,
50.])}
```



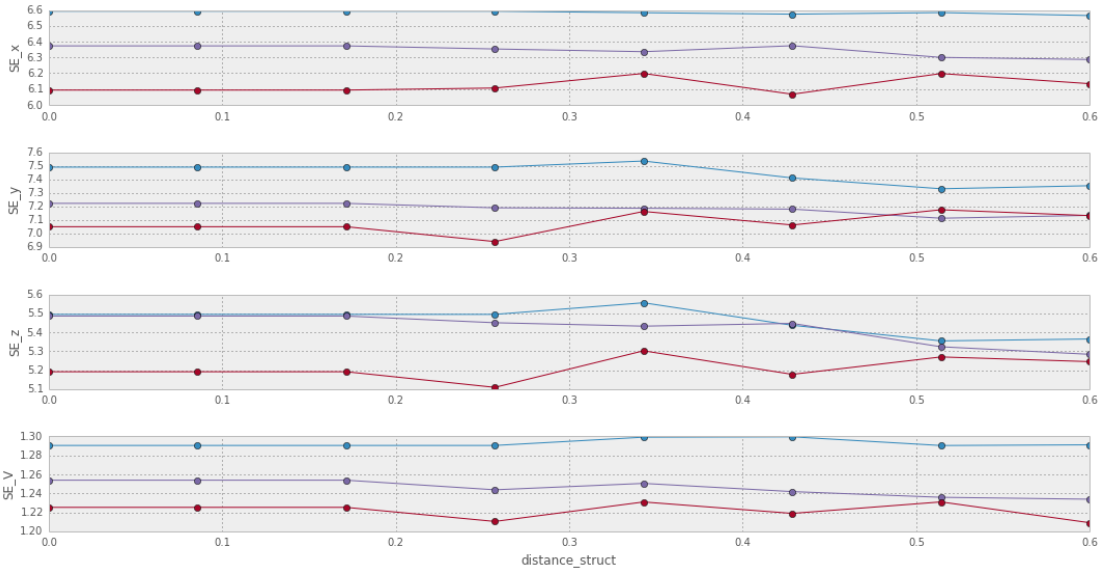
In [23]:
```
params = {'G_struct': np.linspace(.0, .1, 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'G_struct':
array([ 0.        ,  0.01428571,  0.02857143,  0.04285714,
0.05714286,
        0.07142857,  0.08571429,  0.1       ])}
```



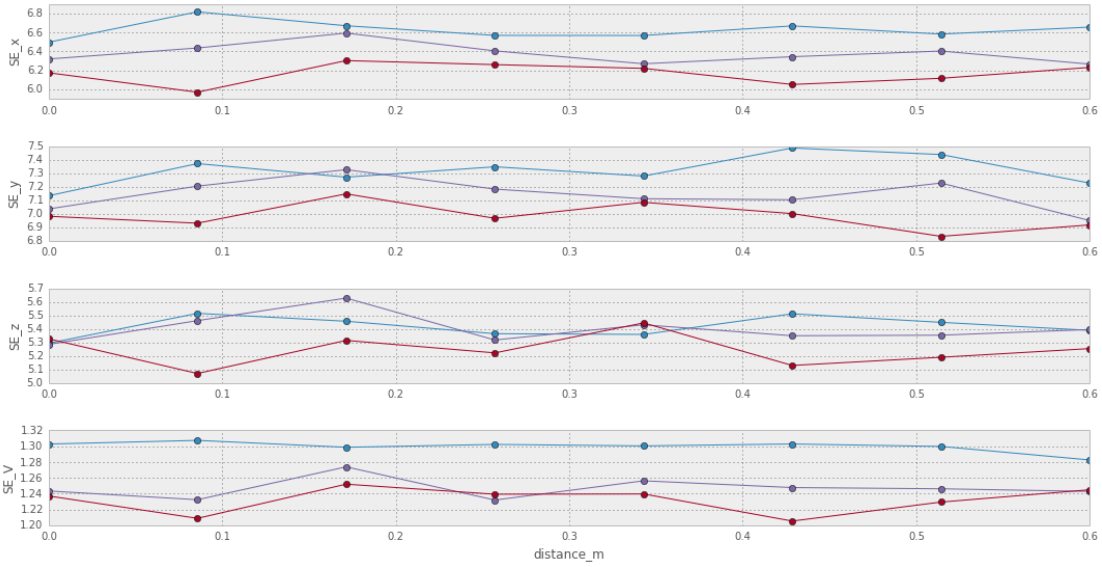
In [24]:
```
params = {'distance_struct': np.linspace(.0, .6, 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) :
{'distance_struct': array([ 0.        ,  0.08571429,  0.17142857,
0.25714286,  0.34285714,
        0.42857143,  0.51428571,  0.6       ])}
```



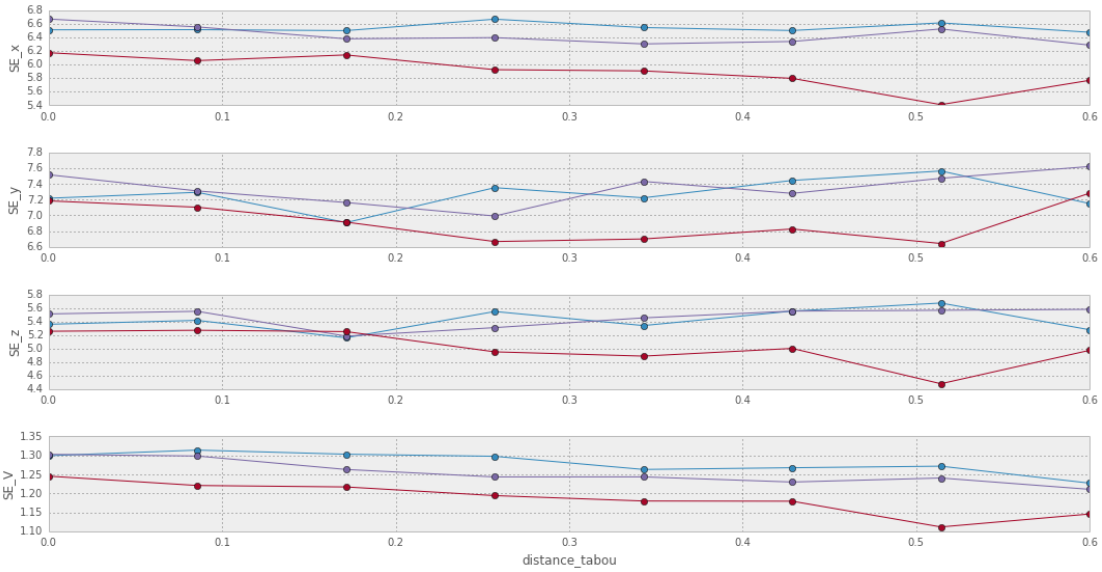
In [25]:
```
params = {'distance_m': np.linspace(.0, .6, 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) :
{'distance_m': array([ 0.        ,  0.08571429,  0.17142857,
0.25714286,  0.34285714,
        0.42857143,  0.51428571,  0.6       ])}
```



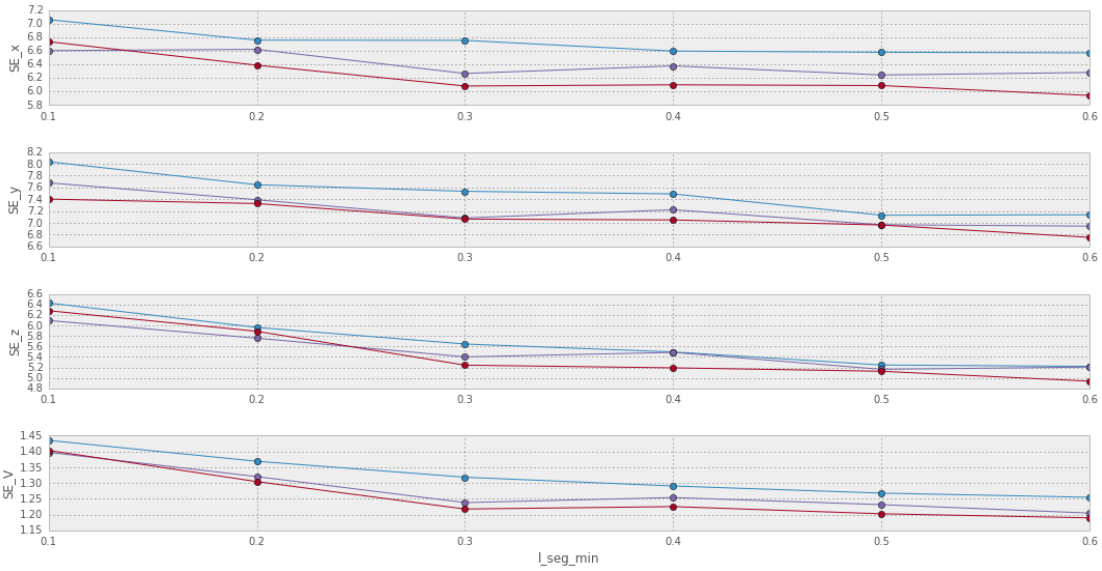
In [26]:
```
params = {'distance_tabou': np.linspace(.0, .6, 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) :
{'distance_tabou': array([ 0.        ,  0.08571429,  0.17142857,
0.25714286,  0.34285714,
        0.42857143,  0.51428571,  0.6       ])}
```



In [27]:
```
params = {'l_seg_min': np.linspace(.1, .6, 6, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'l_seg_min':
array([ 0.1,  0.2,  0.3,  0.4,  0.5,  0.6])}
```

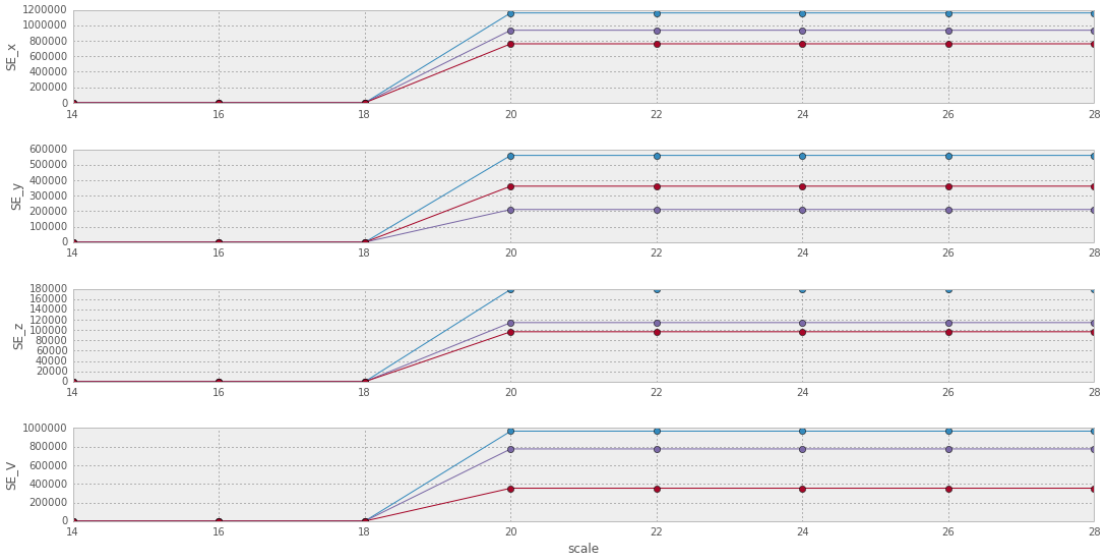


In [28]:
```
#params = {'kurt_struct': np.linspace(-2, 0., 5, endpoint=True)}
#simul_param(p, **params)
```

3.3 paramètres d'échelle

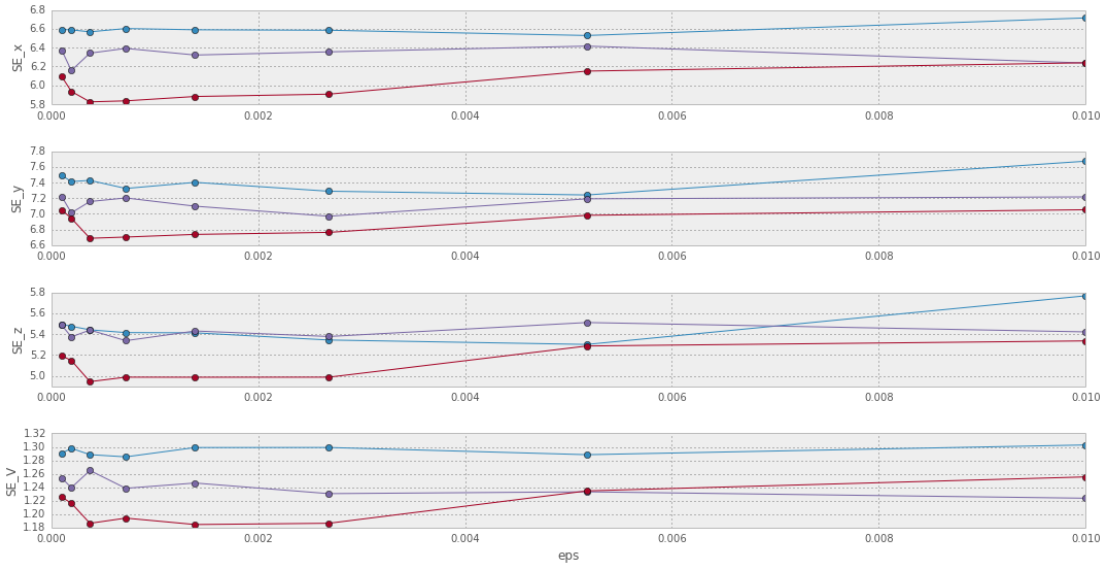
In [29]:
```
params = {'scale': np.linspace(p['scale_max']*.7, p['scale_max']*1.4, 8, endpoint=True
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'scale':
array([ 14.,  16.,  18.,  20.,  22.,  24.,  26.,  28.])}
```



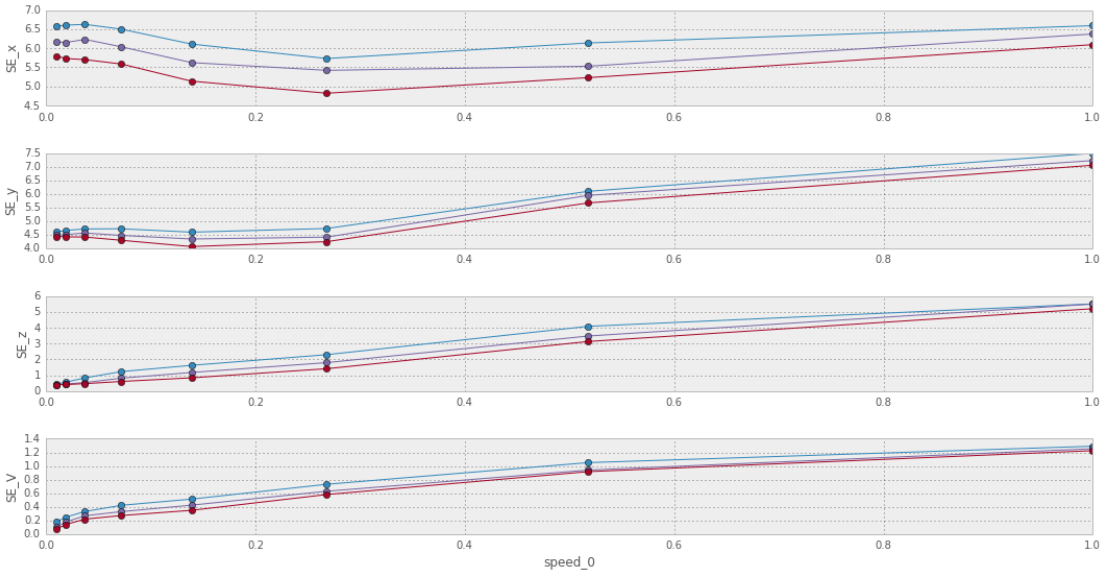
In [30]:
```
params = {'eps': np.logspace(-4, -2, 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'eps':
array([ 0.0001    ,  0.00019307,  0.00037276,  0.00071969,  0.0013895
,
        0.0026827 ,  0.00517947,  0.01      ])}
```



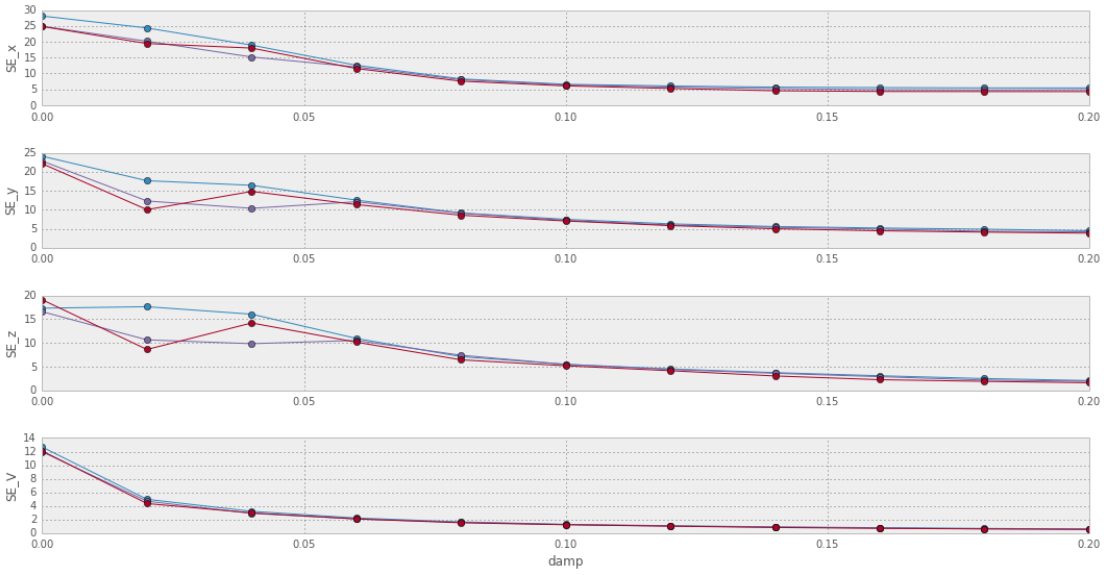
In [31]:
```
params = {'speed_0': np.logspace(-2., 0., 8, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'speed_0':
array([ 0.01      ,  0.01930698,  0.03727594,  0.07196857,
0.13894955,
        0.26826958,  0.51794747,  1.        ])}
```



In [32]:
```
params = {'damp': np.linspace(.0, .2, 11, endpoint=True)}
simul_param(p, **params)
```

```
Studying stability by changing model along variable(s) : {'damp':
array([ 0.  ,  0.02,  0.04,  0.06,  0.08,  0.1 ,  0.12,  0.14,  0.16,
        0.18,  0.2 ])}
```



In [32]: