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This script plots the evolution of the fastest simulation

1 - Define paths

```
workpath = '/Users/akv020/Projects/Dataverse/source/figure2';  
datapath = '/Users/akv020/Projects/Dataverse/data/250m_resolution';
```

2 - Load data

```
cd(datapath)  
x = ncread('Ne11_L02_V18.nc', 'x');  
y = ncread('Ne11_L02_V18.nc', 'y');  
t = ncread('Ne11_L02_V18.nc', 't');  
nev = ncread('Ne11_L02_V18.nc', 'ne');
```

```
% Needed for plotting horizontally  
nev = permute(nev, [2, 1, 3]);
```

3 - Define times to plot

Define interesting times

```
idx = 7:24;  
  
cd(workpath)  
% Use Equation 5 in article  
[perturbation] = perturbation_signal(nev);
```

4 - Estimate spatial growth

```
tstop = 300;  
istop = tstop/10 +1;  
for i = 1:istop  
    vne = nev(:, :, i);  
    dne = max(vne, [], 2) - min(vne, [], 2);  
    nemax = max(dne(:));  
end
```

```

nemin = min(vne(:));

% Use Equation 6 in article
ne_th = (nemax - nemin) * 0.1;
idxs = find(dne > ne_th);

if isempty(idxs)
    idx(i) = y(round(length(y)/2));
else
    idx(i) = y(idxs(1));
end
end
end

```

5 - Plot evolution

```

FIG = figure('units', 'centimeters', 'position', [0, 0, 36.0, 39.0]);
sx = 0.045;
sy = 0.065;
fz = 18;
lw = 3;
colormap(inferno)
alf = 'a':'z';

for i = 1:length(idxx)
    subplot_tight(7, 3, i, [sx, sy])
    imagesc(x, y, log10(squeeze(nev(:, :, idxx(i)))))

    % Set labels and properties for specific subplots
    if any(i == [1, 4, 7, 10, 13, 16])
        ylabel('y [km]', 'interpreter', 'latex');
        yaxisproperties = get(gca, 'YAxis');
        yaxisproperties.TickLabelInterpreter = 'latex';
    else
        set(gca, 'YTick', [])
    end

    if i > 15
        xlabel('x [km]', 'interpreter', 'latex');
        xaxisproperties = get(gca, 'XAxis');
        xaxisproperties.TickLabelInterpreter = 'latex';
    else
        set(gca, 'XTick', [])
    end

    % Set colorbar for the first subplot
    if i == 1
        c = colorbar;
        c.Location = 'South';
        c.Ticks = [10.5 10.7 10.9 11.1];
        c.FontSize = fz;
        c.Label.String = 'Density [ $m^{-3}$ ]';
        c.Label.Position = [10.817143143245152, -2.672727368094684, 0];
        c.Label.Interpreter = 'latex';
    end
end

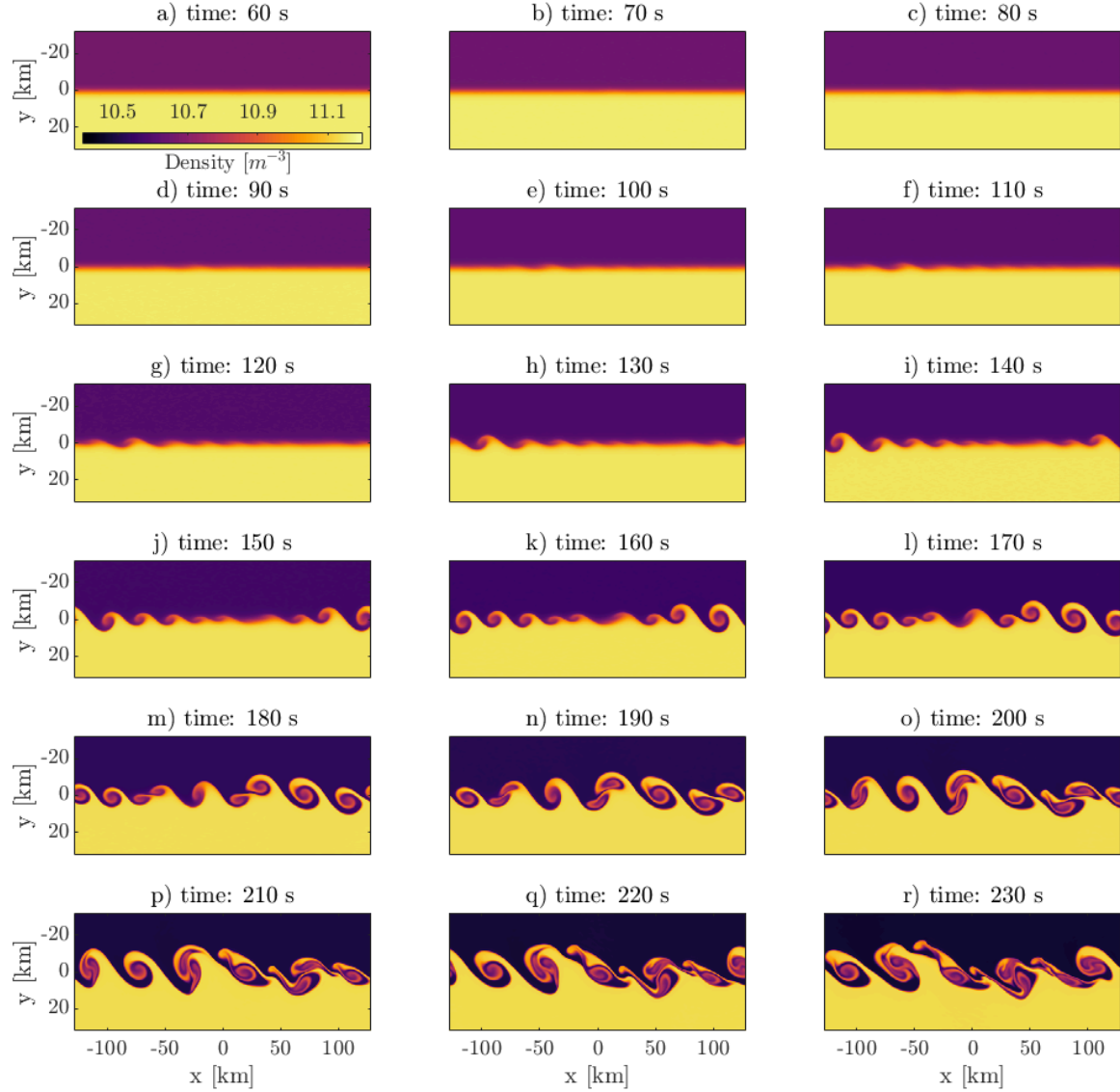
```

```

        set(c, 'TickLabelInterpreter', 'latex')
    end

    % Set plot title
    title([alf(i), ') time: ', num2str((idx(i)-1) * 10), ' s'], 'fontsize',
    fz, 'interpreter', 'latex', 'FontWeight', 'normal')
    clim([10.4 11.2])
    set(gca, 'fontsize', fz)
end

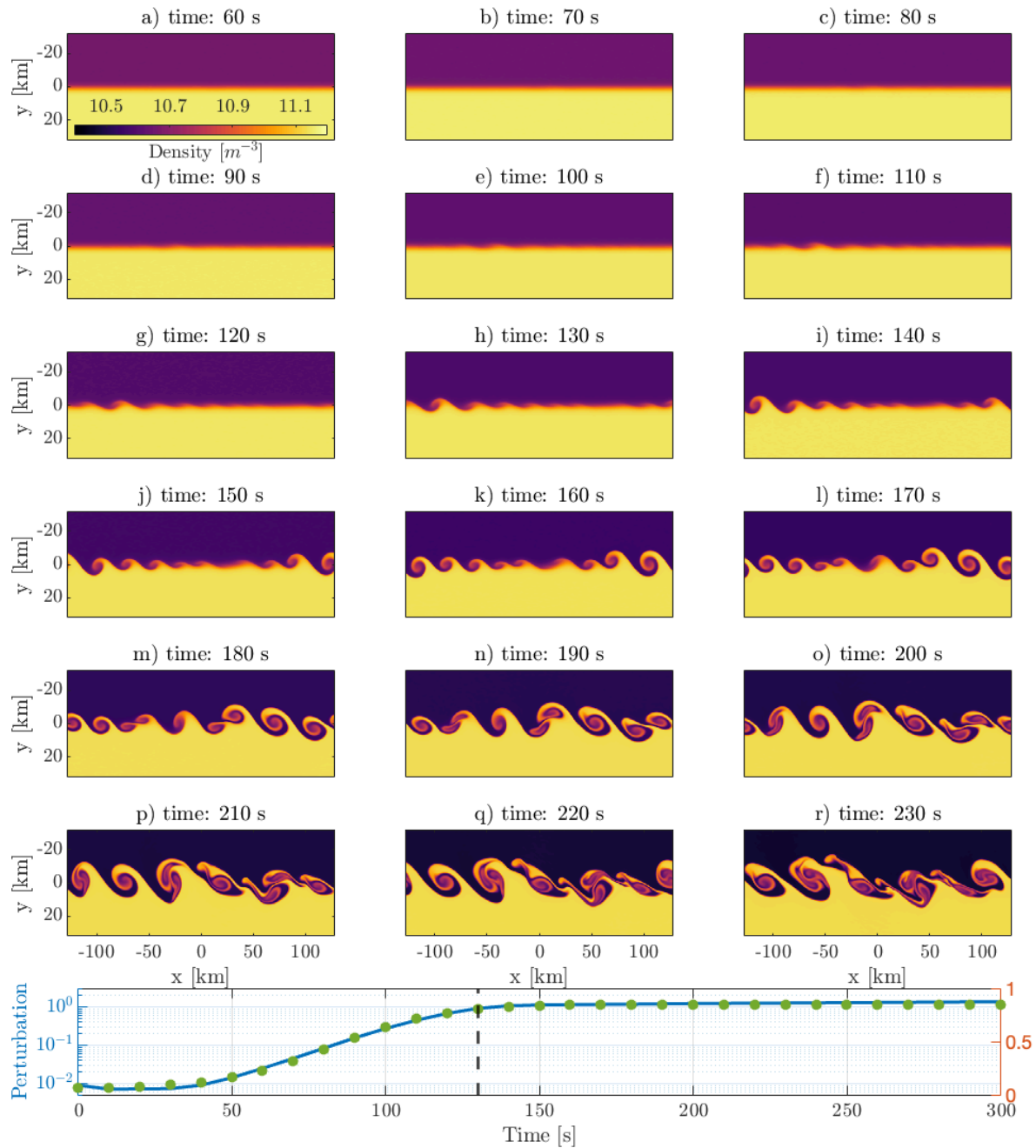
```



6 - Plot the perturbation strength

```
subplot_tight(7, 3, [19 20 21], [sx, sy + 0.01])
times = (0:10:(length(perturbation)-1) * 10);
[saturation_threshold, threshold_crossing_time, param, fitted_signal,
 signal_log] = fitSigmoidAndFindSaturation(times, perturbation,0);

yyaxis left
%figure
h(1) = plot(times, perturbation, 'LineWidth', lw, 'color', [0, 0.4470,
 0.7410]);
hold on
h(2) = scatter(times, 10.^(fitted_signal),100,'filled','MarkerFaceColor',
[0.4660, 0.6740, 0.1880]);
xline(threshold_crossing_time,'--k','LineWidth',lw)
xlim([0 300])
set(gca, 'yscale', 'log')
set(gca, 'Ytick', [0.01 0.1 1])
xlabel('Time [s]', 'interpreter', 'latex');
ylabel('Perturbation', 'interpreter', 'latex');
grid on
set(gca, 'ycolor', [0, 0.4470, 0.7410])
ylim([5e-3 3e0])
axisproperties = get(gca, 'XAxis');
axisproperties.TickLabelInterpreter = 'latex';
yaxisproperties = get(gca, 'YAxis');
yaxisproperties(1).TickLabelInterpreter = 'latex';
set(gca, 'fontsize', fz)
```



7 - Calculate and plot the EW growth

```
[perturbation] = perturbation_signal(nev);
yyaxis right
spatial = round(-idx);
h(3) = plot(times(1:istop), spatial, 'LineWidth', lw, 'color', [0.6350,
    0.0780, 0.1840]);
ylabel('y extent [km]', 'interpreter', 'latex');
text(10, 25, 's', 'FontSize', fz, 'interpreter', 'latex');
set(gca, 'ycolor', [0.6350, 0.0780, 0.1840])
```

```

ylim([-2 30])
yaxisproperties(2).TickLabelInterpreter = 'latex';
legend([h(1) h(2) h(3)], 'Perturbation', 'Fitted Sigmoid', 'Spatial
    growth', 'Position', [0.14 0.0719 0.1328 0.0631], 'FontSize',
    fz, 'interpreter', 'latex');
set(gca, 'fontsize', fz)

```

