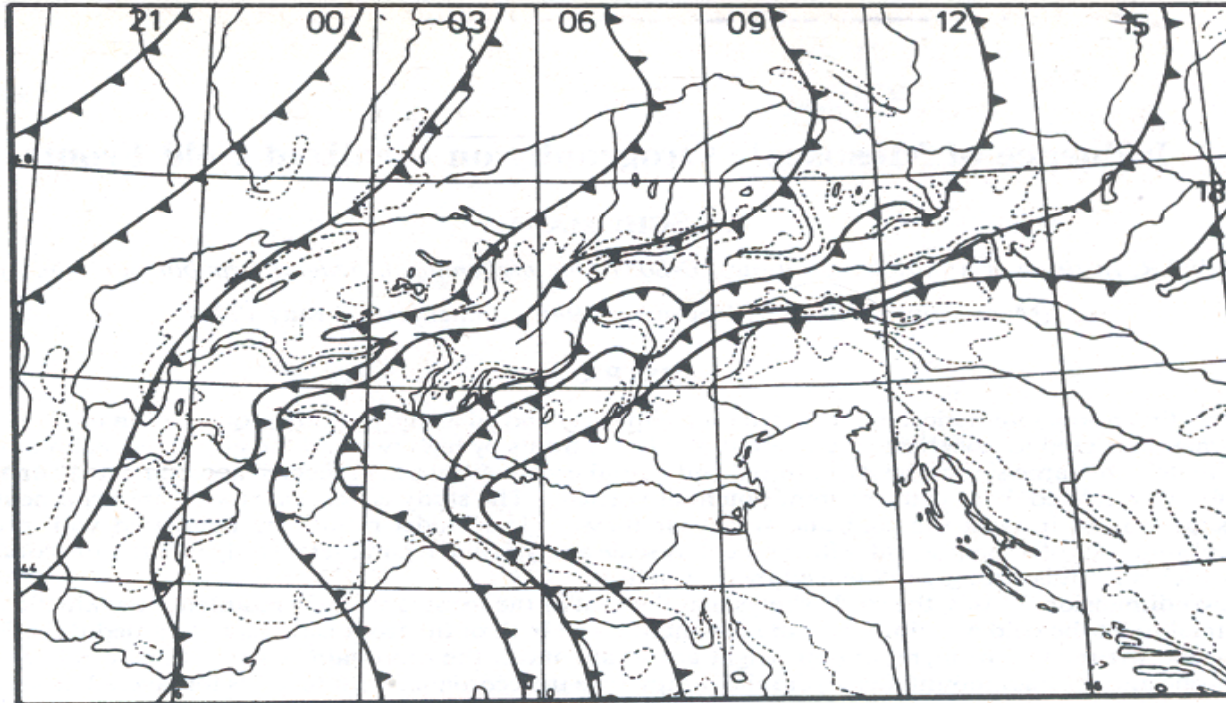


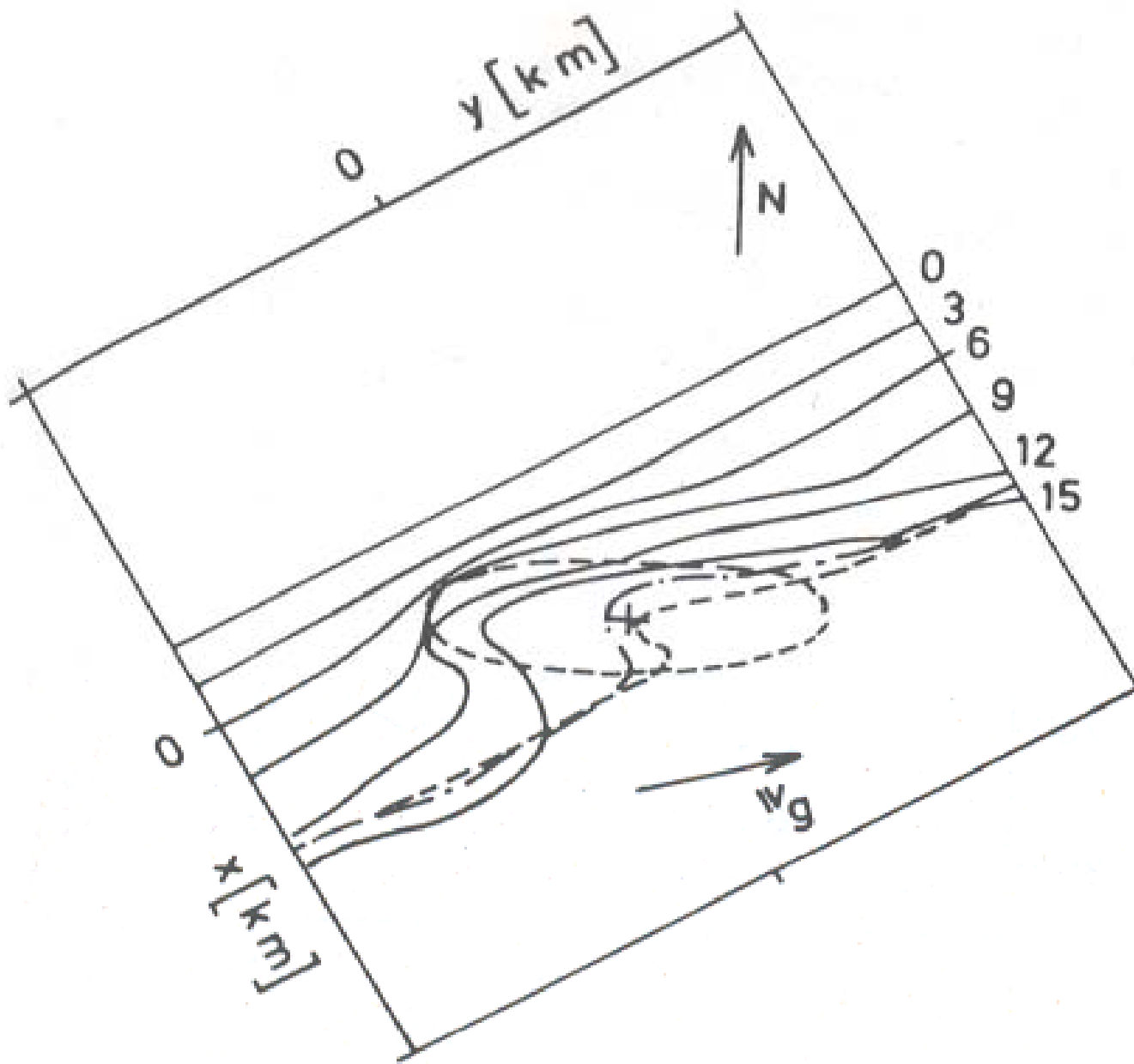
# Numerical studies of orography effects on meso-scale gravity flows in the atmosphere

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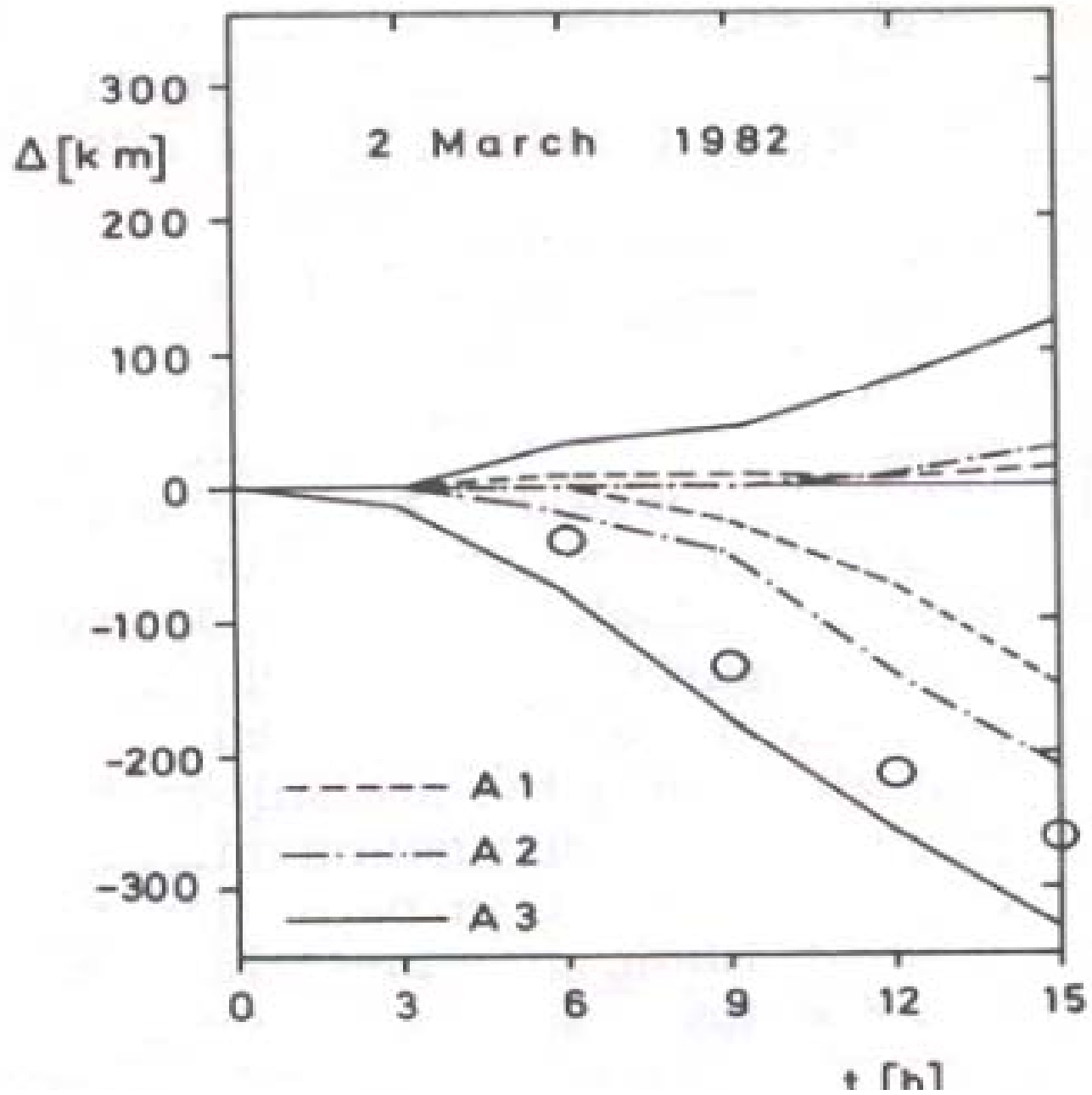


COLD FRONT PROPAGATION  
( Schumann, 1987)



SIMULATED FRONT ISOCHRONES ( Schumann,1987)

# MAXIMUM SURFACE FRONT DEFORMATION (Schumann,1987)



$$\frac{dU}{dt} + \frac{\partial P}{\partial x} = f_1(V - V_g) - f_2W + R_u,$$

$$\frac{dV}{dt} + \frac{\partial P}{\partial y} = -f_1(U - U_g) + R_v,$$

$$\frac{dW}{dt} + \frac{\partial P}{\partial z} + \frac{gP}{C_s^2} = f_2U + g \frac{G^{1/2} \bar{\rho} \theta'}{\theta} + R_w$$

$$\frac{d\theta}{dt} = R_\theta,$$

$$\frac{ds}{dt} = R_s,$$

$$\frac{1}{C_s^2} \frac{\partial P}{\partial t} + \frac{\partial V}{\partial y} + \frac{\partial W}{\partial z} = \frac{\partial}{\partial t} \left( \frac{\bar{\rho} \theta'}{\theta} \right)$$

$$U = \bar{\rho}u, V = \bar{\rho}v, P = \bar{\rho}p',$$

## MODEL EQUATIONS

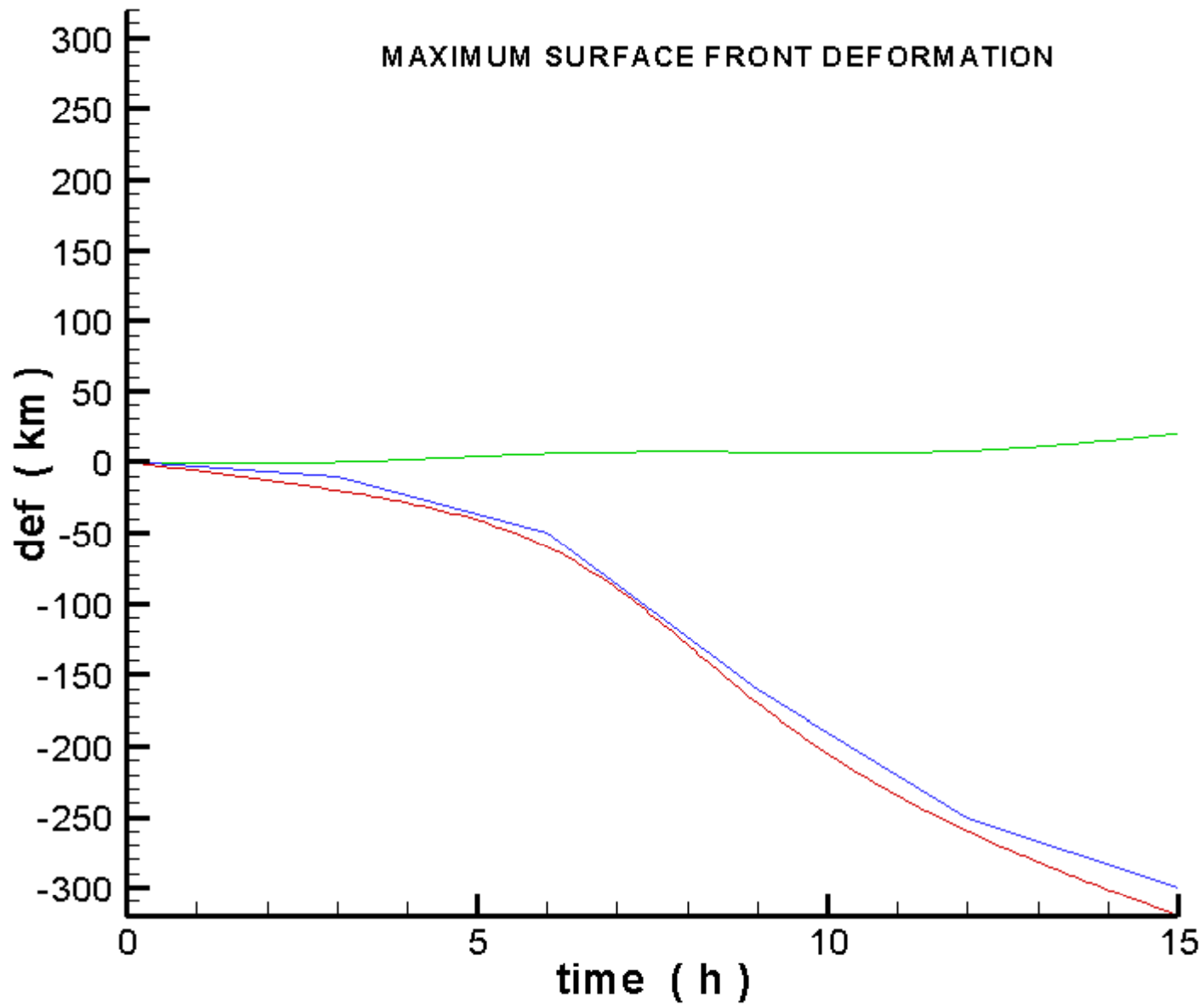
## Semi - Lagrangian Advection

$$x_D = x - \int u dt$$
$$f(x, t + \Delta t) = f(x_D, t)$$

$$f(t + \Delta t) = f_i (1 - \lambda/2 - \lambda^2 + \lambda^3 / 2)$$
$$+ f_{i+1} (\lambda + \lambda^2 / 2 - \lambda^3 / 2)$$
$$+ f_{i+2} (-\lambda/6 - \lambda^2 + \lambda^3 / 6)$$
$$+ f_{i-1} (-\lambda/3 + \lambda^2 / 2 - \lambda^3 / 6)$$

## PHYSICAL PARAMETERS

• Hm	2.5	2.5	km
• L	200.0	200.0	km
• Hf	4.5	9.0	km
• DeltaT	6.0	7.0	K
• U	12.0	10.0	m/sec
• V	40.0	15.0	m/sec
• C	30.0	45.8	m/sec
• R	300.0	458.0	km



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