#### WILDFIRE PREDICTION SYSTEM (WPS) SIMULATIONS (to be used with Prometheus training scenarios)









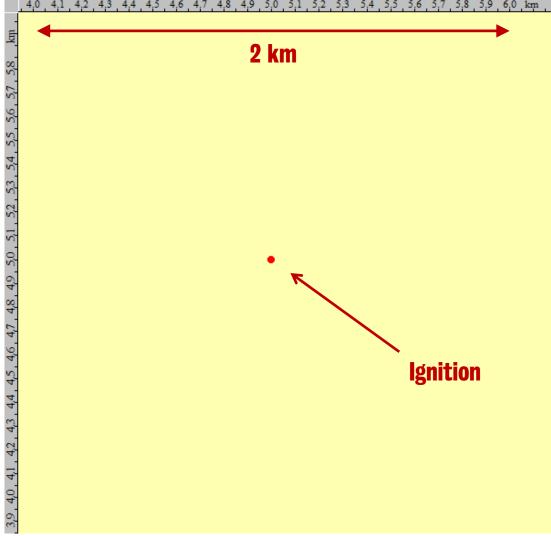


This project is co-funded by SCIENCE OF THE the European Union ENVIRONMENT

### SIMPLE MODEL 1: NO WIND OR SLOPE

#### Open Simulation **1 – NoWindNoSlope.fgm**

- No wind [0 m/s]
- No slope  $[0^\circ]$
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition
- Run the simulation:
- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

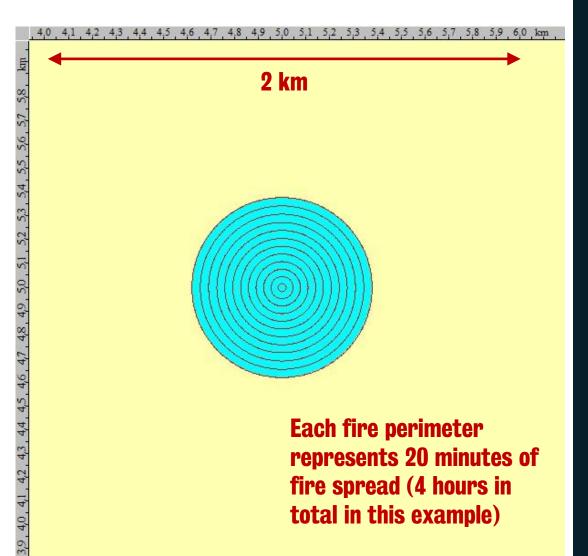


### SIMPLE MODEL 1: NO WIND OR SLOPE

- No wind [0 m/s]
- No slope  $[0^\circ]$
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

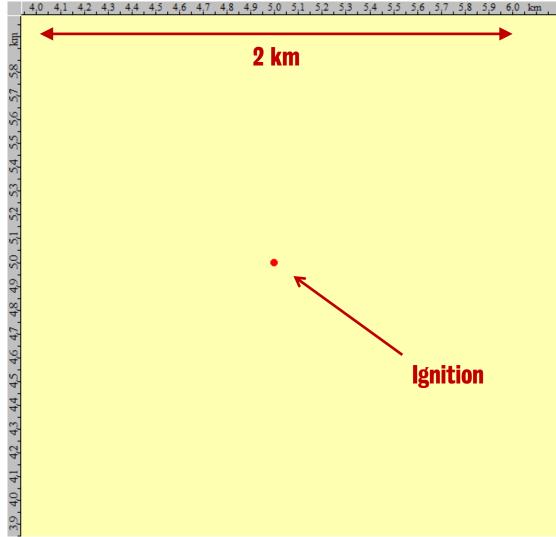
Fire behaviour:

- Uniform spread in all directions (400 m in 4 hours)
- Low intensity (no alignment)

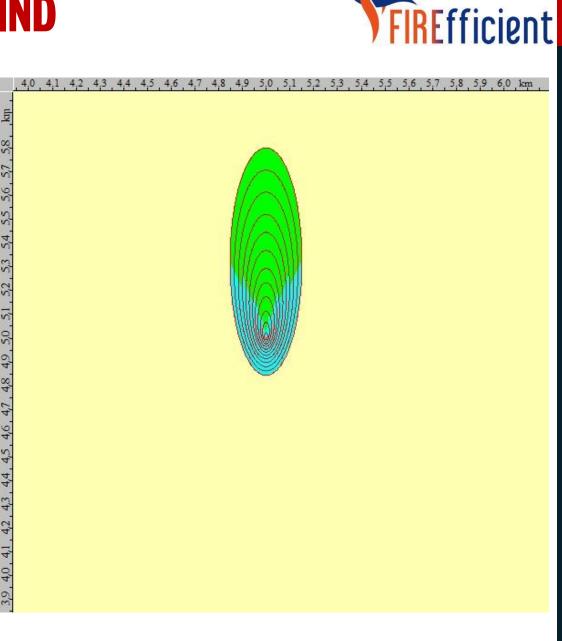


#### Open Simulation 2 – WindNoSlope.fgm

- 10 km/hr wind [2.8 m/s]
- Southerly wind [180°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition Run the simulation:
- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?



- 10 km/hr wind [2.8 m/s]
- Southerly wind [180°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition
- Fire behaviour:
- Spreading faster to the north (800 m in 4 hours)
- Low intensity in backing and flank fires (no alignment)
- Medium intensity in the head fire (alignments = 1)



Change the weather stream so that the wind speed is now 20 km/hr.

- 20 km/hr wind [5.6 m/s]
- Southerly wind [180°]
- No slope  $[0^\circ]$
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

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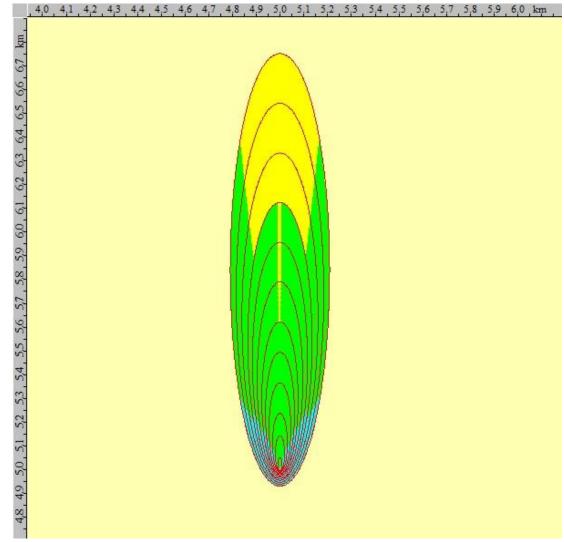


FIREfficient

- 20 km/hr wind [5.6 m/s]
- Southerly wind [180°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

#### Fire behaviour:

- Spreading even faster to the north (1.8 km in 4 hours)
- Low intensity in backing and flank fires (no alignment)
- Medium-to-high intensity in the head fire (alignments = 1)



FIREfficient

Change the weather stream so that the wind speed is now 30 km/hr from the southeast (135°).

- 30 km/hr wind [8.3 m/s]
- Southeasterly wind [135°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

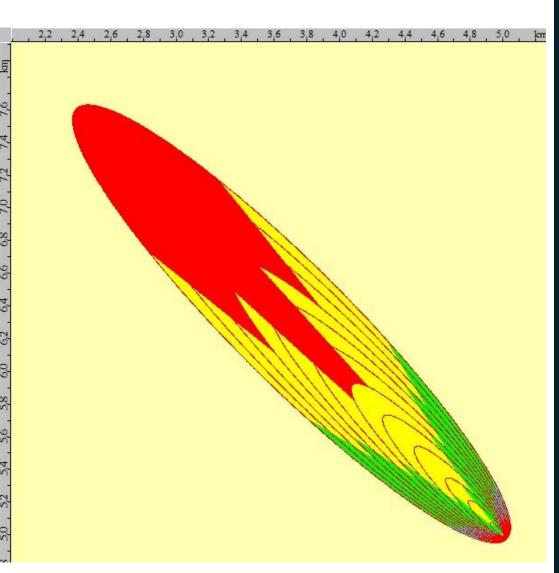
- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

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- 30 km/hr wind [8.3 m/s]
- Southeasterly wind [135°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

#### Fire behaviour:

- Spreading even faster to the northwest (>3 km in 4 hours)
- Low-to-medium intensity in backing and flank fires (no alignment)
- High-to-very high intensity in the head fire (alignments = 1, high wind)





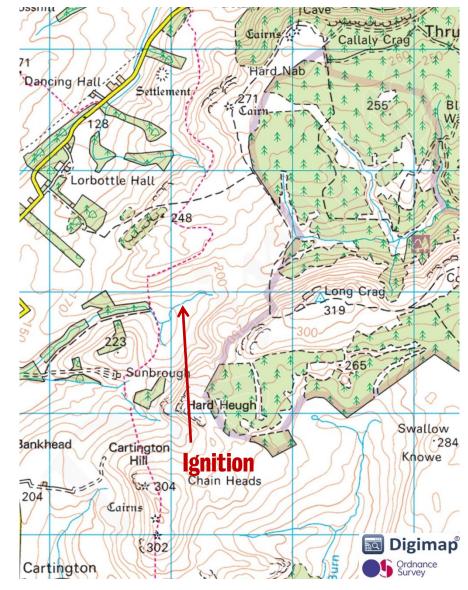
### LANDSCAPE MODEL 1: SLOPE



#### Open Simulation **3 – SlopeNoWind.fgm**

- No wind [0 m/s]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

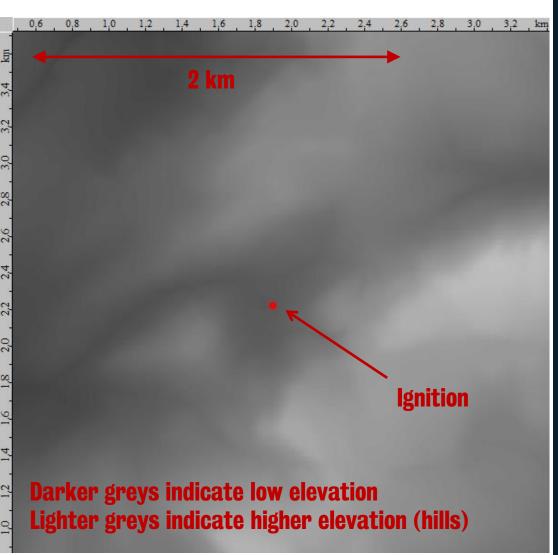


### LANDSCAPE MODEL 1: SLOPE

#### Open Simulation **3 – SlopeNoWind.fgm**

- No wind [0 m/s]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?



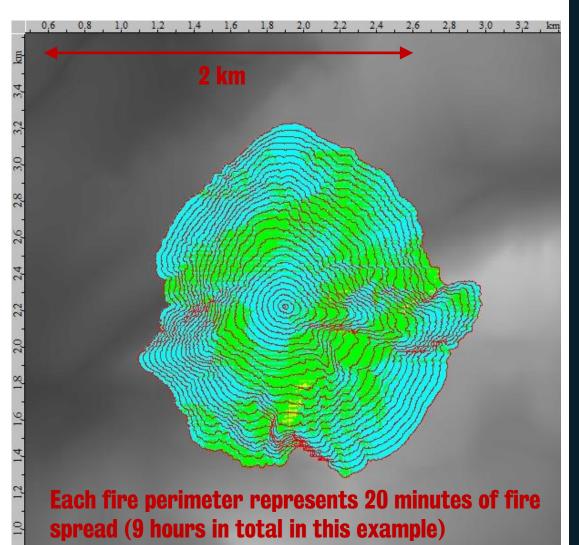


### **LANDSCAPE MODEL 1: SLOPE**

- No wind [0 m/s]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Fire behaviour:

- Initially a uniform spread with low intensity in all directions (no alignment)
- When fire moves upslope it accelerates and becomes more intense (alignment = 1 or 2)
- Fire decelerates on downslopes



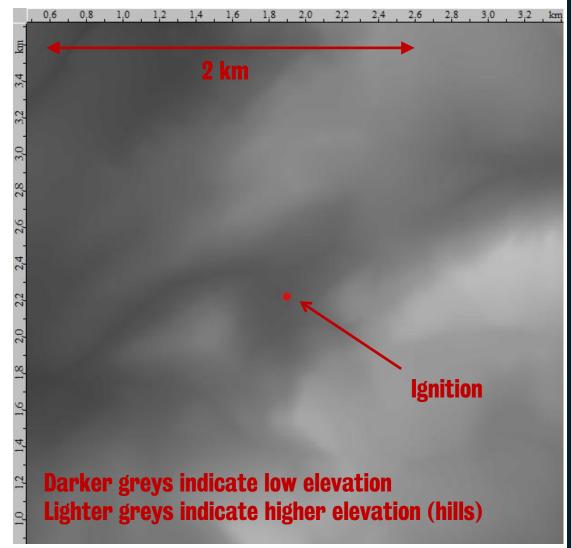


#### Open Simulation 4 – **SlopeAndWind.fgm**

- 10 km/hr wind [2.8 m/s]
- Westerly wind [270°]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Run the simulation:

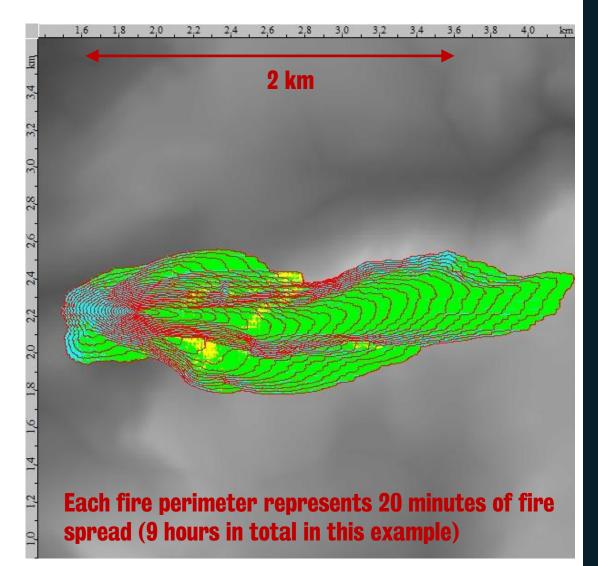
- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?



- 10 km/hr wind [2.8 m/s]
- Westerly wind [270°]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Fire behaviour:

- Fire moves with the slope and wind eastwards
- Head fire burns with medium intensity, but this increases to high intensity on the steepest slopes (yellow patches).
- Fire burns with low intensity against the wind and slope (no alignment)



Change the weather stream so that the wind direction is now from the northwest (315°).

- 20 km/hr wind [5.6 m/s]
- Northwesterly wind [315°]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

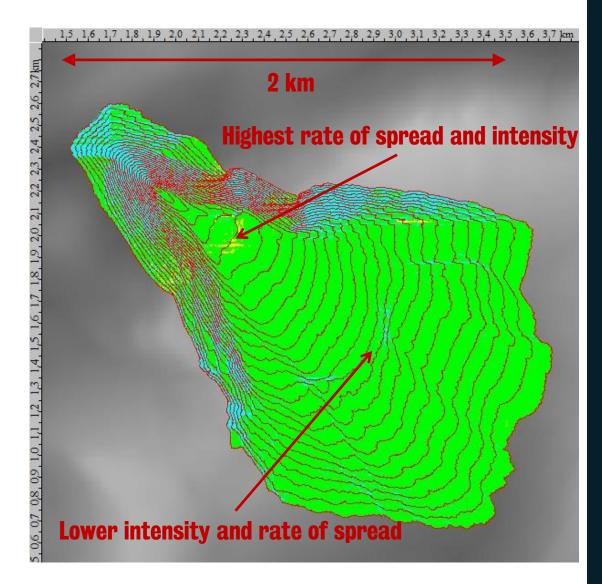
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Temperature       Wind         Minimum       18.0       Minimum Speed       20.0         Maximum       18.0       Maximum Speed       20.0         Direction       315				- -	veat	/eather	<sup>r</sup> Cond	> ondit itions		S		v		OK ancel
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- 20 km/hr wind [5.6 m/s]
- Northwesterly wind [315°]
- Flat terrain moving into hilly terrain
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Fire behaviour:

- Fire moves with the slope and wind southeastwards
- Head fire burns with medium intensity, but this increases to high intensity on the steepest slopes (yellow patches).
- Head fire decreases intensity when going down slope, even with the wind (alignment = 1 or 2, rather than 2 or 3)

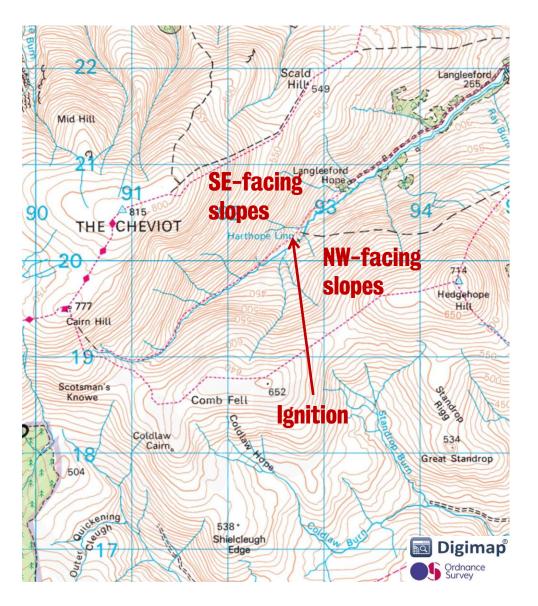


### LANDSCAPE MODEL 3: ASPECT

#### Open Simulation 5 – AspectSlope.fgm

- No wind [0 m/s]
- Valley bottom with SE and NW facing slopes either side
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?





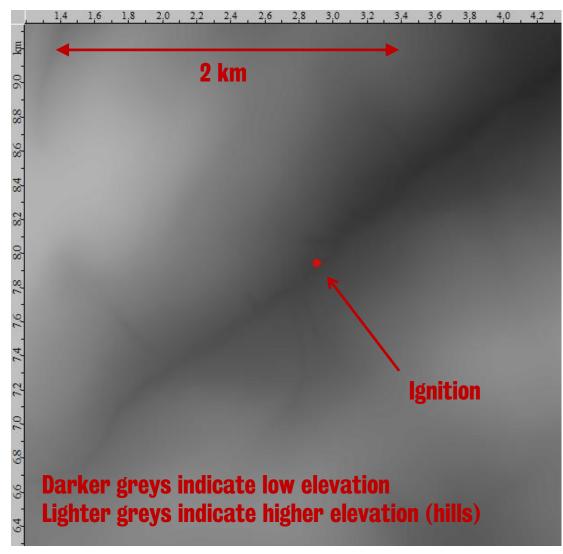
### LANDSCAPE MODEL 3: ASPECT

#### Open Simulation 5 – AspectSlope.fgm

- No wind [0 m/s]
- Valley bottom with SE and NW facing slopes either side
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Run the simulation:

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?

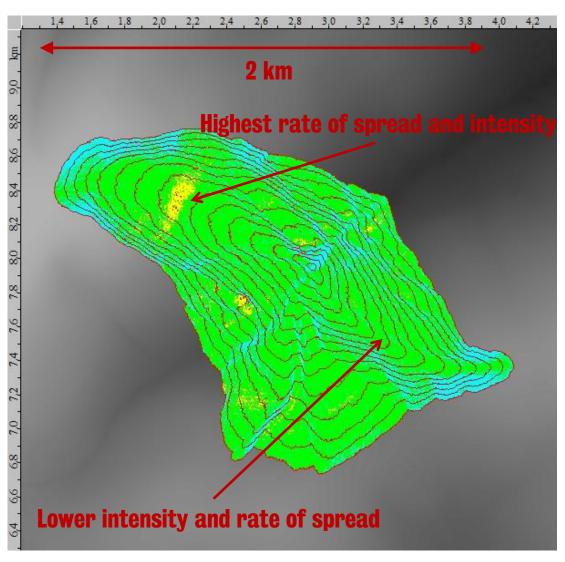


### LANDSCAPE MODEL 3: ASPECT

- No wind [0 m/s]
- Valley bottom with SE and NW facing slopes either side
- 30% relative humidity
- Uniform fuel (dry heather)
- Single POINT ignition

Fire behaviour:

- Fire moves with the slope
- Two head fires moving up both slopes. Head fire along SEfacing slope moves quicker and with more intenisty due to aspect and greater slope (alignment = 2). Head fire along NW-facing slopes moves slower (alignment = 1).
- Lower intensity fire moves up and down the valley.



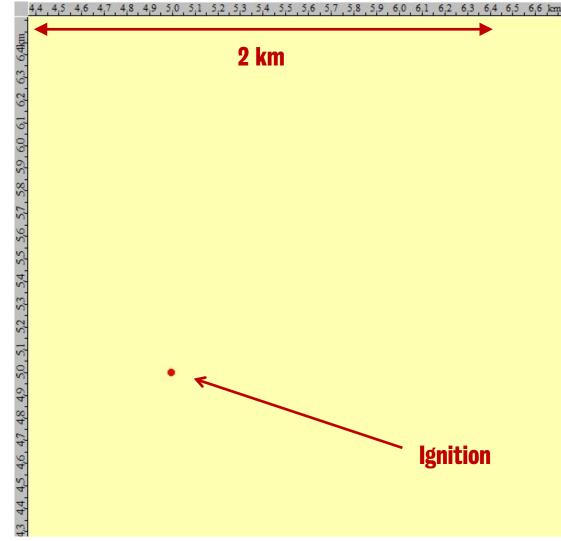
### **SIMPLE MODEL 3: WIND SHIFT**

# FIREfficient

#### Open Simulation **6 – WindShift.fgm**

- 20 km/hr wind [5.6 m/s]
- Southerly wind [180°] changing to Westerly wind [270°]
- No slope  $[0^\circ]$
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

- What fire behaviour should we expect?
- Where will the fire spread?
- What are the fire alignments?



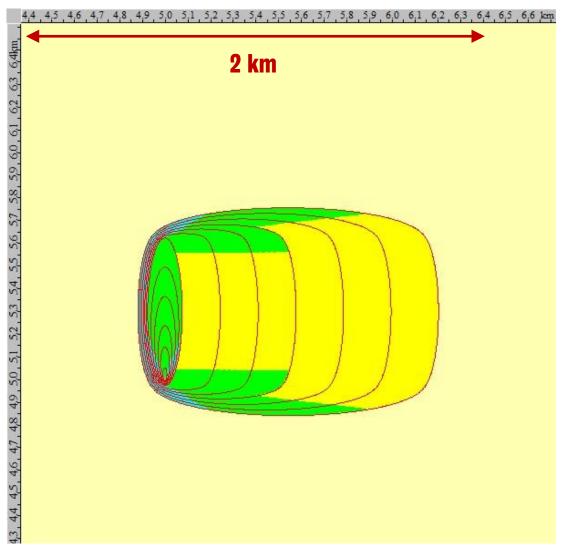
### **SIMPLE MODEL 3: WIND SHIFT**

FIREfficient

- 20 km/hr wind [5.6 m/s]
- Southerly wind [180°] changing to Westerly wind [270°]
- No slope [0°]
- 30% relative humidity
- Uniform fuel (dry grass)
- Single POINT ignition

#### Fire behaviour:

- Spreading to the north (600 m in 2 hours)
- Low intensity in backing and flank fires (no alignment)
- When wind changes direction, the slow-moving low-intensity east flank fire becomes a large quickmoving (1 km in 2 hours) high-intensity head fire.



#### **SIMPLE MODEL 3: WIND SHIFT**



Change the wind speed and wind direction in the weather stream by clicking on "edit" and then "hourly". Here you can adjust the time of the wind shift and the direction that it shifts to, as well as the wind speed. Try doing the same for some of the landscape models used previously.

Name:	Weat	her Strean	n				Start	Date:	November	11,20	13		
esterday's l	Daily Star	ting Code	s				End	Date:	November	17, 20	13	- A-	
		FFMC:	85.	0			- Today's Hour	ly Startir	ng Code —				
		DMC:	25.	0			-	HFFMC:	8	5.0	@ Hour	: 16 📑	
			200.	0									
		DC:					Method of Ho						
Precipitatio	n (12:01	- 23:00):	0.	0 mm			🔘 Diu	rnal (La	wson)	0 H	ourly (Va	an Wagner	)
eather Co	nditions												
Date	Time	Temp	RH	Precip	WS	WD	HFFMC	DMC	DC	BUI	HISI	HFWI	<u>^</u>
Nov 11													
Nov 11	00:00	20.0	30	0.0	10	180		25	200	38	0.0	0.0	
Nov 11	01:00	20.0	30	0.0	10	180		25	200	38	0.1	0.1	
Nov 11	02:00	20.0	30	0.0	10	180	45.6	25	200	38	0.1	0.2	
Nov 11	03:00	20.0	30	0.0	10	180	50.6	25	200	38	0.3	0.4	
Nov 11	04:00	20.0	30	0.0	10	180	55.3	25	200	38	0.5	0.7	
Nov 11	05:00	20.0	30	0.0	10	180	59.6	25	200	38	0.7	1.0	-
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omments						>	Daily.						
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Temperature	Relative			
	Humidity	Precipitation	Wind Speed	Wind Direction
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	180.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
20.0	30.00	0.0	20.0	270.00
	20.0 20.0	20.0         30.00           20.0         30.00	20.0         30.00         0.0           20.0         30.00         0.0	20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0           20.0         30.00         0.0         20.0

#### thomas.smith@kcl.ac.uk @DrTELS

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#### NERC SCIENCE OF THE ENVIRONMENT



National Centre for Earth Observation

NATURAL ENVIRONMENT RESEARCH COUNCIL

Field Spectroscopy Facility









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