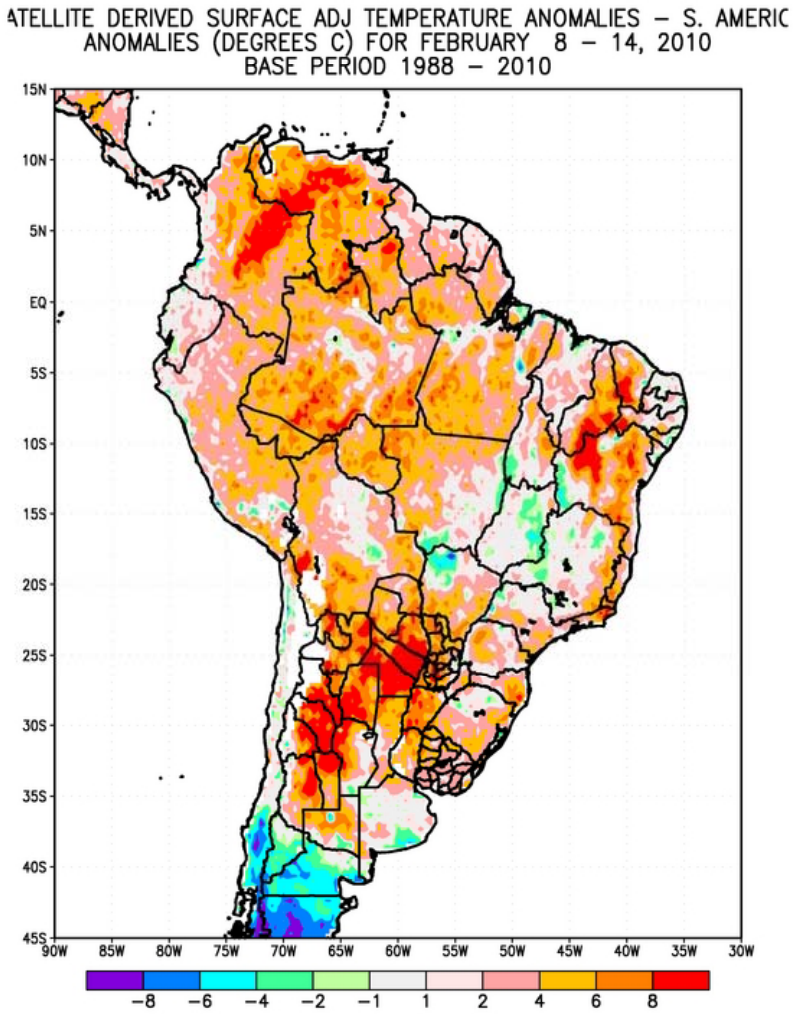
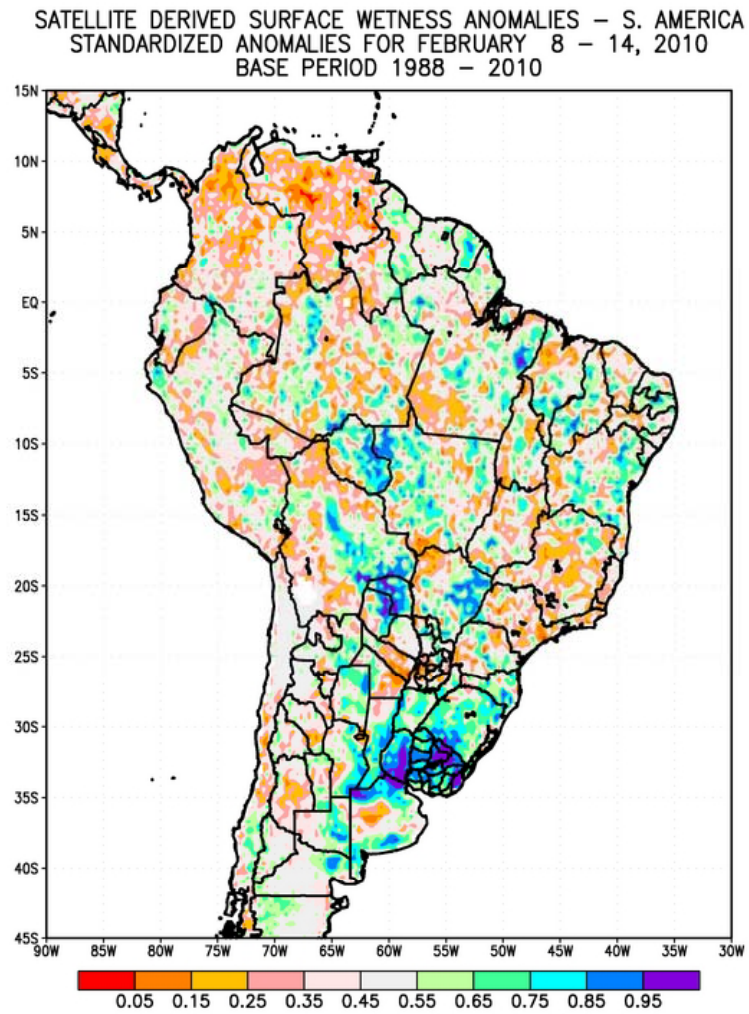
WeatherPredict CONSULTING INC.

Satellite Derived Surface Wetness and Temperature Products





Introduction

- **SSMI monitors near real-time changes in growing conditions throughout the world:**
  - **Only product that accurately measures land-condition under almost all sky conditions,**
  - **Proprietary software analyzes surface temperature, wetness and snow cover at county level (every 30 km),**
  - **Raw SSM/I microwave data collected by 3 reliable DMSP satellites, whose data have been available since 1987.**

How Our Information is Derived

- Polar orbiting satellites
  - Fly between the poles 28 times a day;
  - Monitor most areas of the globe twice daily;
  - Provide complete global coverage in five days;
  - Onboard Special Sensor Microwave/Imager (SSM/I) instruments read passive (naturally emitted) microwave energy;

- Data Processing Technology
  - Each surface type has different microwave emission;
  - 15 years of R&D have established corrections for variations in emissivity;
  - Resultant data sets of Surface Wetness, Temperature and Snow Cover;

Data Sets

- **Land Surface Wetness, our most important data set, includes:**
  - Surface water from all sources: precipitation, snowmelt, and irrigation,
  - Water near the surface and in the top soil,
  - Precipitation,
  - Water in the canopy,
  - Melting snow cover,
  - Wetlands and other water bodies.

Has a strong correspondence with the upper level soil moisture at many locations.

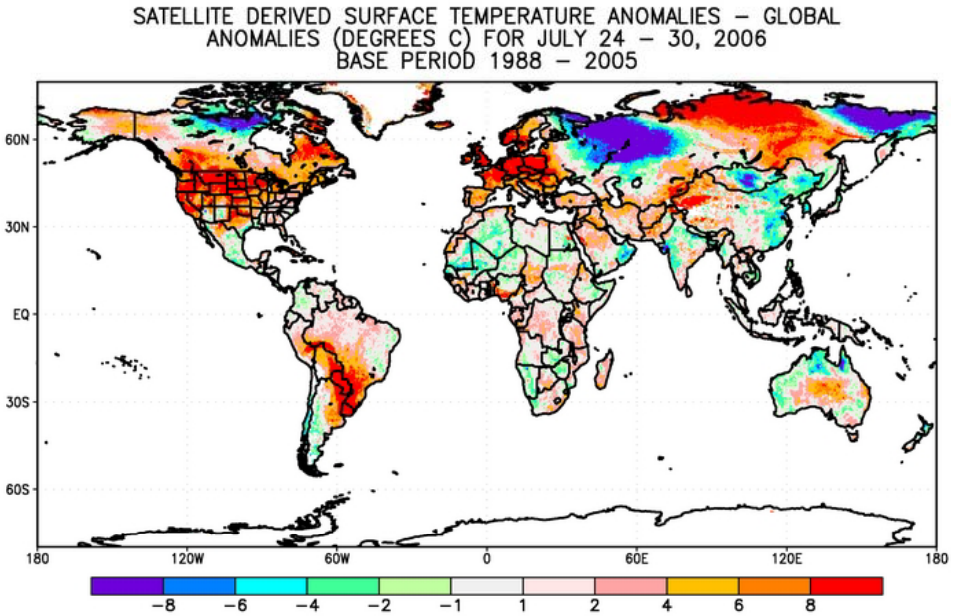
Data Sets

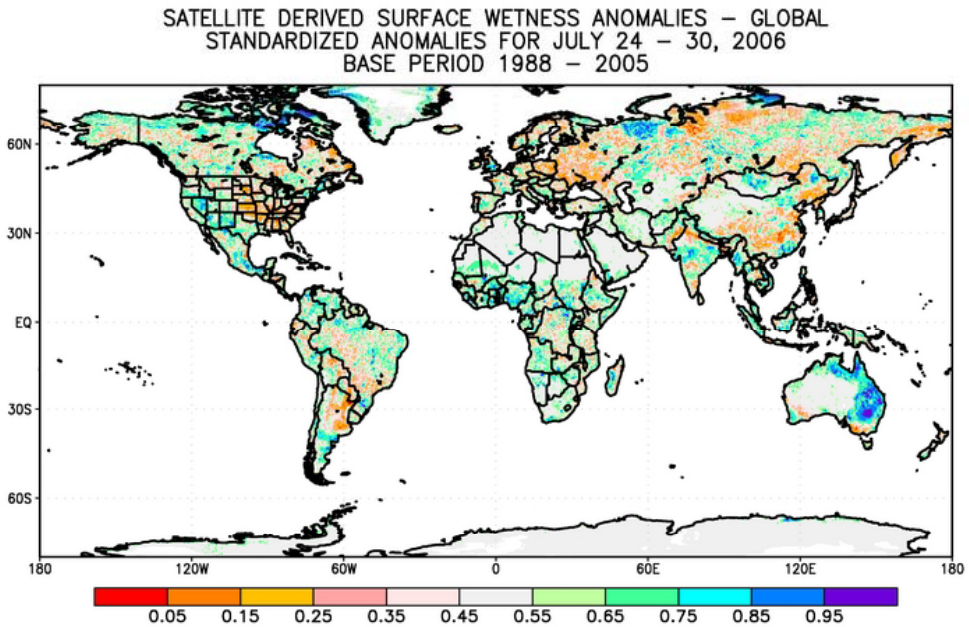
➢Land Surface Temperature Data

- Identifies available heat for germination, vegetative growth and overall plant development,
- Identifies areas where crops are undergoing heat stress,
- Monitors available heat for pathogen growth.

➢Snow Cover

- Identifies the extent of snow cover relative to normal,
- Monitors availability of snow cover to protect winter wheat and other crops,
- Detects the availability of melt-water and irrigation supplies.





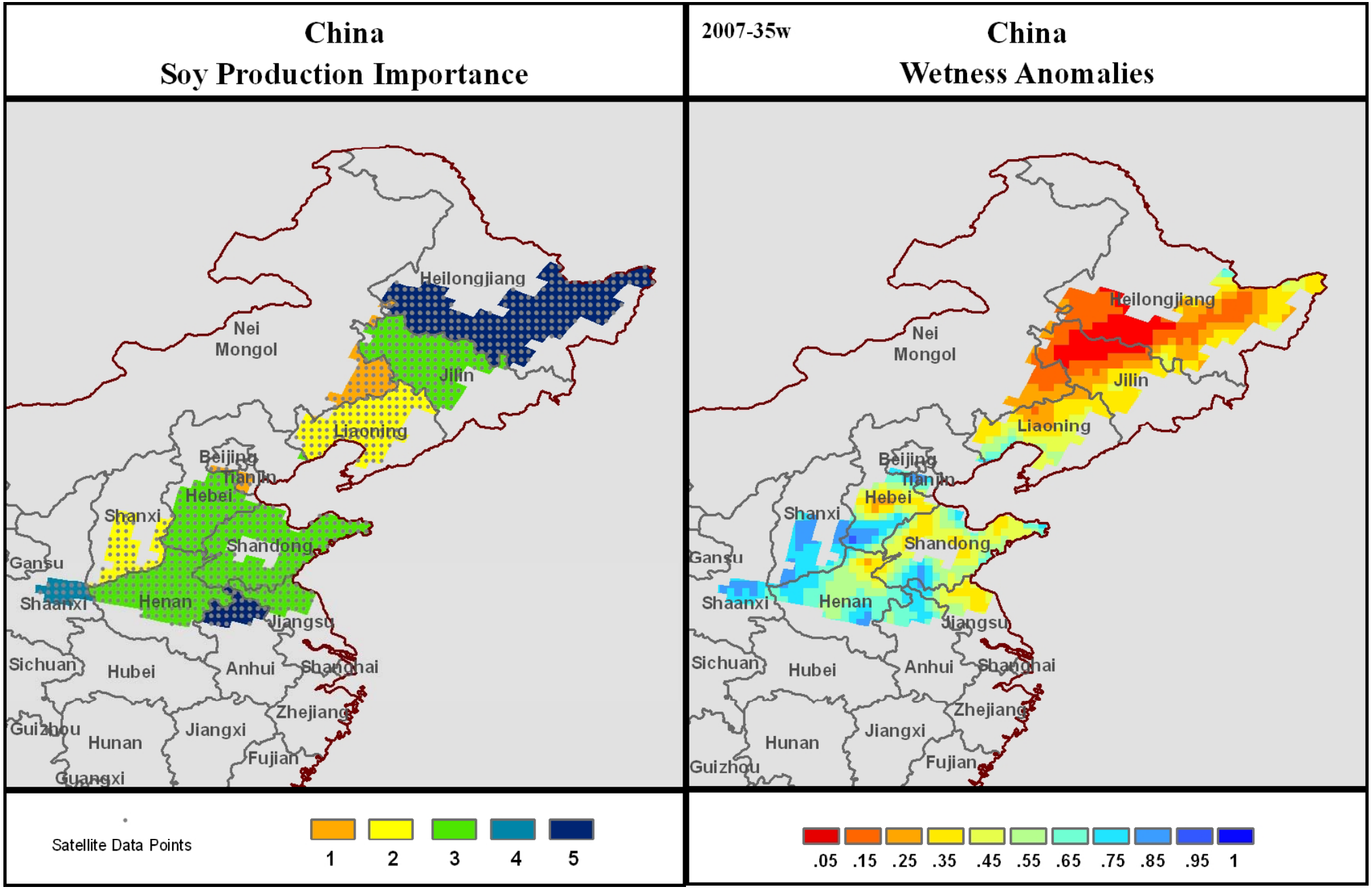
Full spatial distribution of Temperature and Wetness anomalies

One can visually monitor how weather impacts yields during the growing season.

Anomaly Values are a foundation for our modeling success.

- Anomalies calculated with respect to a 20 year base period starting in 1988.
- Base period determines what is “normal” for each global location, for each week,
- Anomalies allow us to identify advantageous and adverse growing conditions.
- Advantageous or adverse growing conditions should result in higher or lower yields, respectively.
- The trick is to identify which conditions are advantageous and which are adverse for a particular month (or growing stage) in question.

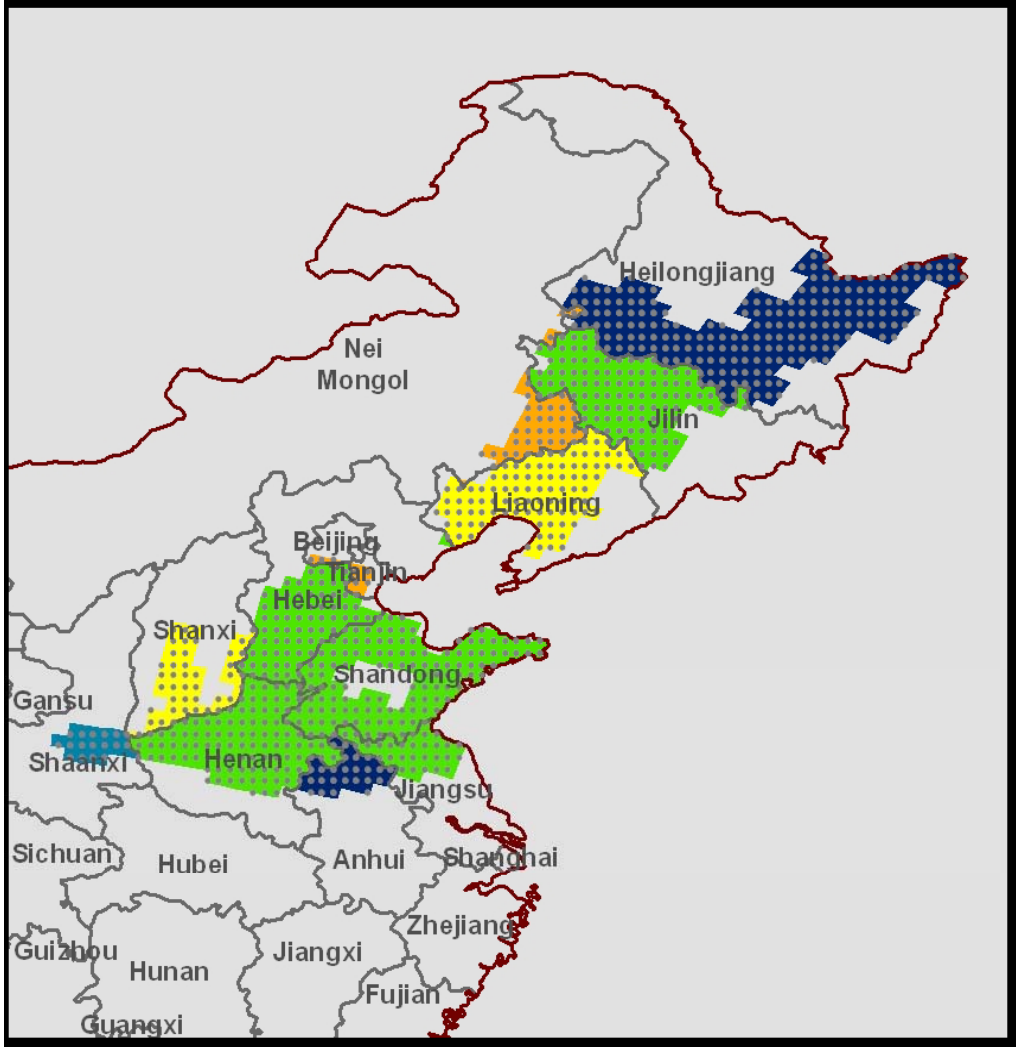
WeatherPredict CONSULTING INC.



Week 35 is the end of August, a critical period in the yield potential of soybeans

WeatherPredict CONSULTING INC.

China
Soy Production Importance

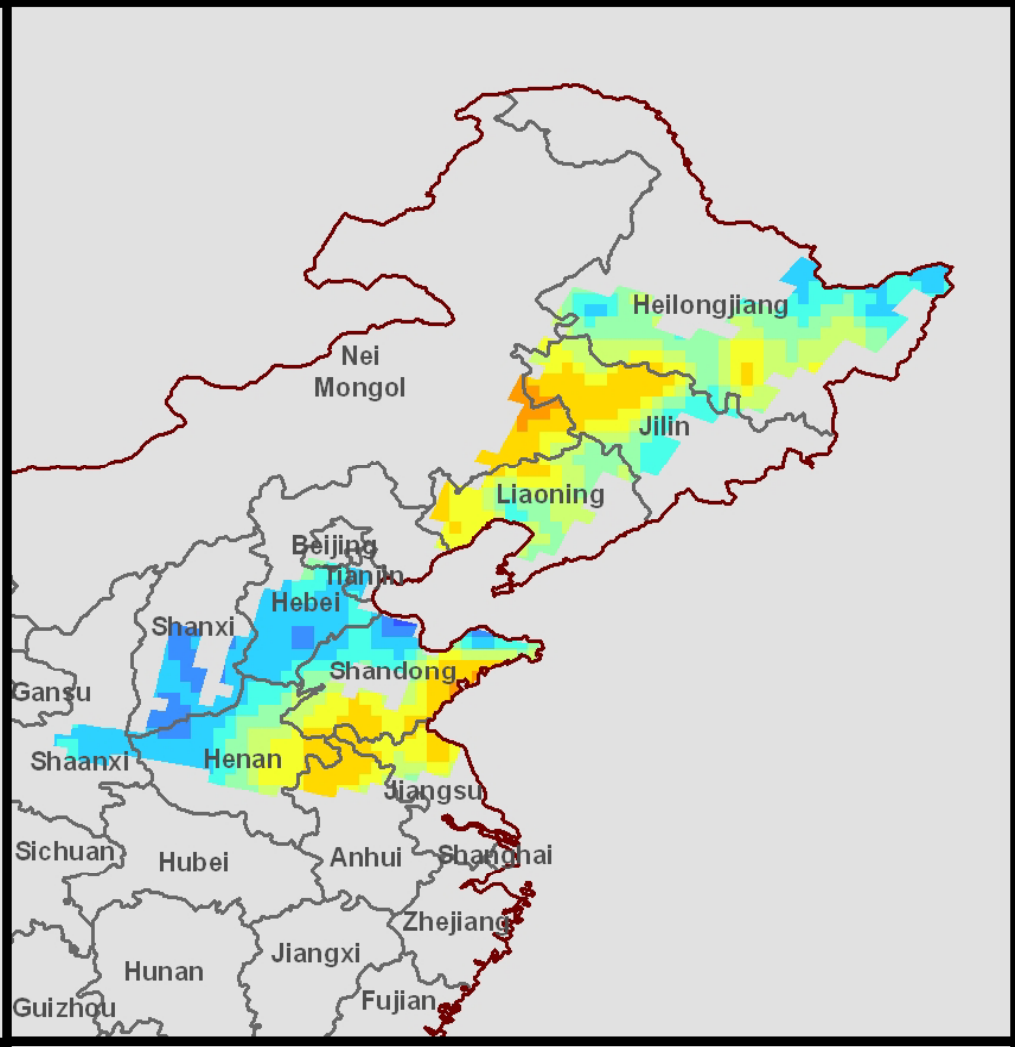


Satellite Data Points

1 2 3 4 5

2007-35w

China
Temperature Anomalies



-8 -6 -4 -2 -1 0 1 2 4 6 8+

Forecast Example, October 2007, China Soy Yield:

- Used Minnesota soybean model for Heilongjiang,
- Used known US state analogs for other provinces,
- Suggested variables of SSMI Temperature and Wetness

CHI forecasted overall China Yield at **1.67 MT/ha**.
The preliminary number from the USDA was **1.72 MT/ha**. The USDA final number went down to **1.64 MT/ha.**

Corn and Wheat Forecasts were similarly successful.

Notes on SSMI and Yield Forecasting

• Using anomaly data, agricultural potential can be forecast throughout various stages of the growing season.

• Wetness and temperature anomalies have been accurately and precisely correlated to yield estimates.

• Wetness and temperature anomalies can be used to explain variations in yield at the county level.

•Models are developed independently for each crop and growing condition.

WeatherPredict CONSULTING INC.

Soybean forecasts for Brazil		
State	Yield (MT/ha)	% National Production
Mato Grosso	3.01	27
Paraná	2.98	22
Rio Grande do Sul	1.90	15
Goiás	2.93	12
Mato Grosso do Sul	2.58	8
Bahia	2.94	4
Minas Gerais	2.71	4
São Paulo	2.71	4
Santa Catarina	2.67	1
Maranhão	3.24	1
Brazil	2.76	Weighted Avg.

IPAD	2.86

Yield for 2010 growing season, forecasted in early Feb, 2010

Improvements over other Ag Monitoring Services

- Better spatial coverage when compared to rain gauge networks
- Soil wetness is an integrator of numerous factors that affect available soil moisture
- Soil wetness anomalies lag precipitation, since soils are storage mediums
- Better ability to monitor the effect of irrigation.
- Lead time advantage over NDVI And Greenness Measures:
    - Color change follows the impacts of surface wetness and temperatures.
- Microwave signals significantly less affected by clouds, which typically cover over half of the world at any point in time